ANNUAL REPORT 1990/1991

British Columbia Cancer Agency

British Columbia Cancer Research Centre

British Columbia Cancer Foundation

93-00031/

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British
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Cancer
Agency

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Mr. B.T. Schmidt
Chief Operating Officer

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Assistant Deputy Director, Operations

Mrs. L.B. Jamieson
Assistant Deputy Director, Nursing and Related Patient Care Services
(April 1 - May 31)

Mrs. L. Bradley
Acting Assistant Deputy Director, Nursing and Related Patient Care Services
(June 1, '90 - March 31, '91)

Dr. D. Osoba
Head, Communities Oncology Program

Dr. P. Coy
Director, Victoria Clinic

Mr. P. McAllister
Administrator, Victoria Clinic
(April 1 - November 1)

Mr. J. Cawsey
Administrator, Victoria Clinic
(January 15)

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Report of the President & the Director

Jane van Roggen

David J. Klaassen

Dear Mr. Minister:

On behalf of the Board of Trustees and staff of the British Columbia Cancer Agency, we are pleased to provide you with some of the highlights of the activities of your cancer program over the past year.

Our major challenge continues to be the provision of care to the ever-increasing number of cancer patients in this province. Because of the aging of the population as well as immigration, this year we have seen a further 3.4 percent increase in the numbers of cases referred to our centres. This has strained our physical and personnel resources to the limit. The resulting pressure has been most noticeable in the area of radiation treatment services, resulting in a large number of patients who are waiting an unacceptably long period of time for this important cancer treatment method. This is most acute in the Vancouver Clinic but during the year became a problem at our Victoria Clinic as well. You approved the referral of some of these patients to several centres in the State of Washington. The cooperation and concern of your Ministry was appreciated.

Other areas of the organization are showing similar but less dramatic stresses, for example there are now significant delays occurring in the time taken to assess Pap smears. Also, we are concerned about our ability, with the resources available, to de-centralize cancer care through our Communities Oncology Program. We are doing the best we can to make our delivery of care as efficient as possible and still maintain the world-renowned high quality that for which we have become famous. This is becoming increasingly difficult.

The financial restraint program announced by your Ministry towards the end of the year has made us review our priorities in the delivery of care. We are particularly concerned about our ability to provide chemotherapy drugs to the Province within the budget provided. It will be impossible for us to support the provision of chemotherapy drugs by taking funds from other areas of the operating budget to the detriment of other programmes.

With your Ministry's approval we initiated the construction of an addition to the Vancouver Clinic which includes two linear accelerators. The projected completion date is July 1991. We also completed a functional plan for the proposed new clinic attached to the Surrey Memorial Hospital to be opened in 1994. This plan was approved by your Ministry so we will now hire architects to do the detailed planning. As well, we initiated a further study of the need ior similar facilities in the Interior of the Province.

The major highlight of the year was the conclusion of tripartite discussions between the B.C. and Yukon Division of the Canadian Cancer Society, the B.C. Cancer Foundation and our organization with the end result that the Division has taken on the fundraising responsibility for all three organizations. This will provide an assured source of funds, albeit initially at a very minimum level, for the running of the Research Centre. However, we believe that on a long-term basis this will enhance the fundraising capability for cancer in the Province by eliminating competition and reducing confusion in the minds of the public. An inter-Agency committee has been struck to provide advice to the Division and to monitor the administration of the agreement.

Discussions were also held between the Foundation and the Agency concerning the Agency taking on the responsibility of managing the Research Centre for the Foundation in the interests of administrative, fiscal and scientific planning efficiency. This has been accepted in principal by both parties.

During the year an important capital fundraising campaign was jointly run by the Foundation and the Agency. The campaign had not been completed by the end of the year but to date, approximately four million of the proposed five million dollars had been raised with the hope that the goal will be reached in the near future. The outstanding contributions of Mrs. Barbara Brink, the Chairman, Mr. Gordon MacFarlane, the Honorary Chairman, and the multitude of volunteers, both from the corporate sector, as well as the Foundation and Agency, are gratefully acknowledged. The success of this campaign has greatly encouraged the staff who will benefit from it and will allow us to reach a new level of excellence with the "tools" that the campaign provided.

Similar to virtually every other health care organization in the Province, we made a submission to the Royal Commission on Health Care Costs. In it we noted the patient care crisis we are facing and recommended both long and short term strategies to be implemented to cope with it which include the construction of new facilities, expansion of professional training programs and the expansion of community support programs. As well, research into the cause and improved treatment of the disease must be fostered through the support of a cancer research infrastructure and continued program excellence in our tertiary centre in Vancouver. Information systems must be provided for outcome measurement and for optimum utilization of financial resources. Investments are required for health promotion and prevention. We specifically recommended that the Provincial government place a one cent tax on each cigarette, the proceeds of which should be totally dedicated to funding cancer prevention and treatment services, as well as other smoking-related prevention activities. We also recommended revenue-generating activities such as marketing medical services to non-Canadians.

During the year the Board approved a reorganization of our senior committee structures as well as a new enhanced role for the Professional Advisory Committee to allow us to prepare for the projected growth in the Cancer Agency over the next decade, including the addition of new cancer treatment facilities, as well as the expansion of the existing programs.

In the previous year we had not only changed our name to the British Columbia Cancer Agency, but also renamed out Vancouver facility, which is now called the Vancouver Clinic of the B.C. Cancer Agency. A special ceremony took place during the year in which the building housing the Vancouver Clinic was named the "A. Maxwell Evans Building" in recognition of the many contributions to the care of cancer patients in this Province provided by Dr. A. Maxwell Evans, the first Director of the British Columbia Cancer Institute, the original cancer treatment centre in Vancouver.

The Screening Mammography Program of B.C., which practises the breast cancer screening service under the broad umbrella of the Agency but with membership from many other organizations, particularly the radiologists of the Province, carried out its mandate in an exemplary fashion during the year, proving that screening for breast cancer can be carried out by this cost-efficient, high quality service. New clinics were added in Victoria, Kelowna and Burnaby, with continued screening through the Vancouver and Surrey Centres and the travelling van based

in Kamloops. Plans exist to expand to four or five more centres in the coming year. This program is developing national recognition.

We continue to carry out exciting world class research into the causes, the epidemiology and the treatment of cancer in our clinics and the laboratories located in the Cancer Research Centre. We collaborate not only with other scientists and physicians in the Province but also with many investigators located in the rest of Canada and other countries. These successes are well documented in the extensive list of publications noted elsewhere in this report and the acquisition of close to five million dollars in grant and personal support.

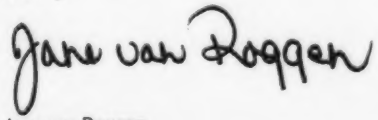
In the field of education we expanded our radiation technology program to train more of these important professionals who are in short supply throughout the world. Our radiation and medical oncology training programs, for which we are primarily responsible, received a very favorable review by the Royal College of Physicians and Surgeons as part of a review of the training programs of the Faculty of Medicine of the University of British Columbia. As well, our participation in many other training programs was acknowledged and deemed important. A cross-departmental oncology program was approved and set up within the Faculty of Medicine to provide a higher profile for oncology activities in that Faculty. Many other important educational activities also continued at a very high level throughout the year, many of which were in part funded by the Jambor Knowledge Fund. Our Pharmacy Division spearheaded the development and publishing of a comprehensive manual on cancer drugs which has received wide distribution.

The Board of Trustees continues to provide excellent guidance and supervision of the cancer program. Their hard work on the many Board Committees is much appreciated. We welcome Mr. Lou Jewitt from Prince George who replaces Marnie Dawson, whose contributions over the years are gratefully acknowledged.

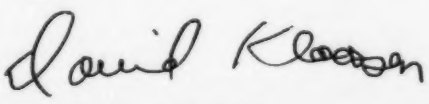
The outstanding work of the staff of the Agency in providing and maintaining the excellence of our nationally and internationally recognized research and education programs, but particularly in maintaining the highest quality of cancer care in the face of restraint and limited resources, continues to be a source of pride but also of concern as we recognize that considerable signs of stress are being noted. This was documented in a study done on the Quality of their Worklife. Measures are and must be instituted to improve our staff support.

The Agency is blessed with volunteer support from the organizations who work with us, namely, our Auxiliary, the Order of the Eastern Star, the IODE and the Freemasons. These organizations, year after year, provide extensive volunteer and financial support and their unflagging level of commitment is a source of great support and encouragement to the patients, staff and our Board. The previously noted tripartite arrangement further enhances the excellent working relationships with our sister organization, the B.C. and Yukon Division of the Canadian Cancer Society and we support and recognize their many contributions in the areas of fundraising for research, patient services and education.

In spite of the many challenges that face us, we are proud of our record of accomplishments this past year which has resulted in further recognition that we are one of the premier cancer programs in the country.



Jane van Roggen
President



David J. Klaassen, MD, FRCPC
Director

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Dr. A.C. Eaves

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P.J. Hoskins*

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Honorary Member, BCCA Professional Staff
(Deceased December 1990)

P.S. Rennie, PhD
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J.R. Vielkind, PhD
Assistant Professor (Pathology, UBC)

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Head
Honorary Lecturer

F.S. Chen, BSc,MSc
(Victoria)

R.W. Harrison, BSc,MSc

S.G. Hussein, BSc,MSc,PhD,FCCPM

G.M. Kennelly, BSc,FCCPM

W.S.Y. Kwa, BSc,MSc,MCCPM

G.K.Y. Lam, BSc,PhD
Honorary Assistant Professor

D.M. Linekin, BSc,MSc,PhD
(Victoria)

L.J. Watts, BSc,MSc

K.F.K. Yuen, BSc,MSc,PhD

Section of Cancer Imaging

B. Palcic, PhD
Head, Senior Scientist
Biophysicist
Professor (Pathology/Physics, UBC)
Adjunct Professor (Applied Science, SFU)

B. Jaggi, MASc,PEng
Research Engineer

M. Korbelik, PhD
Scientist, Cell Biology

C. MacAulay, PhD
Scientist, Physics

H.F. Stich, PhD
Professor (Zoology, UBC)

Nursing

M. Deschamps, RN,BScN,MSc(A) Nursing,PhD Community Health (Epidemiology)
Adjunct Faculty
(School of Nursing, UBC)

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B. Allen, MD,FRCPC
Clinical Associate Professor (Medicine)

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K.W. Chan, MB,FRCPC
Assistant Professor (PT)(Ped)

S.L. Pritchard, BM,BS,FRCPC
Assistant Professor (Ped)

P.C.J. Rogers, MB,MRCP(UK),FRCPC
Associate Professor (Ped)
Head, Division of Pediatric Hematology/Oncology UBC & BCCH

Radiation Oncology

S.M. Jackson, MB,ChB,MD(Manchester),DMRT,FRCR,FRCPC
Head
Clinical Professor (Surgery)

B.D. Acker, BSc(Hon),MD,DABR,FRCPC
Clinical Assistant Professor (Surgery)

S. Alexander, MB,BS,LRCP,MRCS,DMRT,DABR(T),FRCR,FRCPC
(Victoria)

V.E. Basco, MB,ChB,DMRT,FRCR,FRCPC
Clinical Professor (Surgery)

E. Cairns, MD
Clinical Associate

P. Coy, MB,ChB,DMRT,FRCPC
(Victoria)
Clinical Assistant Professor (Surgery)

C. De Metz, MD,FRCPC
(Victoria)

G.G. Duncan, BSc,MB,ChB,MRCP(UK),FRCPC
Clinical Assistant Professor (Surgery)

A.M. Evans, MD
Clinical Associate

R.N. Fairey, BSc(Hon Zoology),MD,FRCPC
Clinical Associate Professor (Surgery)

A.D. Flores, BSc,MD,MB,FRCPC
Clinical Associate Professor (Surgery)

P. Froud, MB,FRCPC
(Victoria)

C.J.H. Fryer*

K.J. Goddard, BSc,MB,ChB,MRCP(UK),FRCPC
Clinical Instructor

G.B. Goodman*

C. Grafton, MB,BS,MRCS,MRCP,FRCR, FRCPC,PhD
Clinical Assistant Professor (Surgery)

J.H. Hay, BA,MA,MB,BChir,DCH,MRCP(UK),DMRT,FRCP,FRCPC
Clinical Assistant Professor (Surgery)

W.Y.V. Leung Lam, BA,MD
Clinical Associate

C.M. Ludgate, MB,ChB,MD,FRCSE,DMRT,FRCPC
Clinical Associate Professor (Surgery) (Victoria)

J.L. Matheson, BA,MD
Clinical Associate

M.F. Manji, MB,ChB,DMRT,MD,DABR, FRCPC
Clinical Associate Professor (Surgery)

M. Mildenberger, MD,FRCPC
Clinical Instructor

I.A. Olivotto, BSc(Zoology),MD,FRCPC
Clinical Assistant Professor (Surgery)

D.E. Rheaume, BSc(Hon Biology),MSc,MD,FRCPC
Clinical Instructor (Surgery)

N.J.S. Voss, LRCP,MRCS,DMRT,FRCR,FRCPC
Clinical Associate Professor (Surgery)

F.L-W. Wong, BSc(Hon Biochem),MD,FRCPC
Clinical Assistant Professor (Surgery)

Section of Developmental Radiotherapy

G.B. Goodman, MB,ChB,DMRT,FRCPC,FRCP(Edin),FRCR,FACR
Head
Clinical Professor (Surgery)

Surgical Oncology

R.E. Robins, MD,FRCSC
Head
Clinical Professor (Surgery)

Senior Allied Professional Staff

L. Bradley, RN,BScN,MBA

L. Chow, BSc(Pharm)

R. Doll, MSW,MSc
Sessional Lecturer (Social Work)
Faculty Associate, Institute of Health Promotion Research (UBC)

L.B. Jamieson, RN,BScN,MBA

Rev. C. Johnstone, BA,BD,ThM
Adjunct Faculty (Vancouver School of Theology)

D. Noble, BSc,BLS

D.C. Richardson, BComm,MHA,CHE

B.T. Schmidt, OD,MSc,CHE
Associate Professor (Health Care and Epi)

*Academic credentials and clinical appointments noted elsewhere.

Volunteer Organizations

Order of the Eastern Star Report

The order of the Eastern Star approved at their Grand Sessions the following cancer projects:

Shane Fellowship - Dr. Thomas Ehlan	**$18,000**
Closed circuit television	**3,571**
Tens Care Kit	**546**
Cell Harvester	**5,950**
Transvaginal Probe	**14,471**
Three chemotherapy chairs	**3,226**
Dentistry - Kavo headpiece 10:1	**205**
Kavo headpiece 1:1	**152**
Nobelpharma torque wrench	**674**
Bottled water drink dispenser	**440**
Ventriculoscopy equipment	**13,780**
Moving Grid (mammography)	**6,042**
Olympus viewing attachment for microscope	**3,139**
MEC TV monitor and receiver model PR'200 S20"	**1,165**
TOTAL	**$71,401**

All these projects were in use at the British Columbia Cancer Agency in 1990; and $11,000 was transferred from our B.C. Cancer Foundation O.E.S. Fund and was added to our $60,401 cancer funds.

We also purchased material and made Cancer Dressings costing $36,740.00 supplying 67 stations and 6 sub-stations. 1048 members worked 23,365 hours making 212,068 total dressings (78,977 have been distributed by the Vancouver Cancer Dressing Station, 601 West 10th Avenue, in Vancouver alone this past year).

The worthy Grand Matron's Special Project Fund of $17,000 purchased 2 Beckman tabletop centrifuges and one Isolation Vibration Free Table, supporting Dr. C. Eaves at the B.C. Cancer Agency's Division of Clinical Hematology and Leukemia Research team.

An O.E.S. Cancer Research Award was received from the B.C. Cancer Agency and B.C. Cancer Foundation for our contributions to scholarships and research projects. This is added to our Cancer Dressing Contribution Award received from the Canadian Cancer Society.

It has been a pleasure working with all of you and we thank your President, the Board, and the Executive and staff members for their kindness and support by bringing awareness to the public of the availability of our Cancer Dressings to patients all over British Columbia and the Yukon.

Lillean Musgrave
Director of Cancer Activities
British Columbia and Yukon
Order of the Eastern Star

IODE

As chairman of the Jessie R. Burke (Memorial) Cancer and Research Fund Committee, it is my pleasure to present this report.

During 1990, IODE members have volunteered over 1400 hours of service at the Coffee Bar on the main floor of the Vancouver Clinic - it is our desire to help patients, families and drivers, pass long hours of waiting more pleasantly over a cup of coffee and a muffin. This area has also been used as a distribution depot for Ensure and other food supplements - this has proven to be helpful to the nutrition department. Approximately $2,000.00 has been received in donations at the Coffee Bar this year.

IODE Chapters throughout B.C. make contributions to the Jessie R. Burke Fund in memory of loved ones or as part of their annual support towards the care and cure of cancer patients. All money from this fund goes directly back to the B.C. Cancer Agency to purchase equipment or provide extra patient comforts. This year two compact fax machines and a photocopier were purchased for the main pharmacy department, this will enable medication and drug information to be faxed between the main pharmacy and level 5 and 6 sattelites and will help decrease the turn around time for medication preparation. Presently we are in the process of providing funds to purchase a small pick-up truck for the Agency to replace the Nissan vehicle purchased by IODE in 1986.

Many thanks to Leslie Bradley and Lorraine Butler of Nursing and Related Patient Care Services, for their suggestions as to ways IODE members can continue to serve and provide assistance at the Vancouver and Victoria Clinics. We are also looking forward to assisting, in any way possible, at the new Clinics about to be built.

Moira Murdoch,
Chairman,
Jessie R. Burke (Memorial)
Cancer and Research
Fund Committee

Patient Care at the Clinic
Acts of Kindness

Kerry Symes and Lorri Iliffe place Jim Ward in a body cast.

Emily Earl assists John Ferguson on 5 West.

"Power comes through co-operation, independence through service and a greater self through selflessness."

John Heider
The Tao of Leadership

"In the most fundamental form, of course, the politics of change is about how we actually live our own lives, and about the effect we have on the people and the microstructures of society immediately around us on whom our way of living impinges directly."

James Robertson

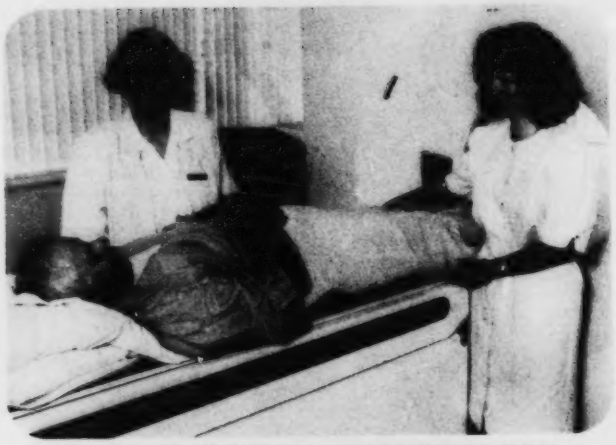
Elizabeth Dohan consults with Joann Collins.

Stuart Stubbs receives chemotherapy from Susan D'Aloisio.

"A man there was, though some did count him mad, the more he cast away, the more he had."

John Bunyan

"Use a sweet tongue, courtesy, and gentleness, and thou mayest manage to guide an elephant by a hair."
Sa'di



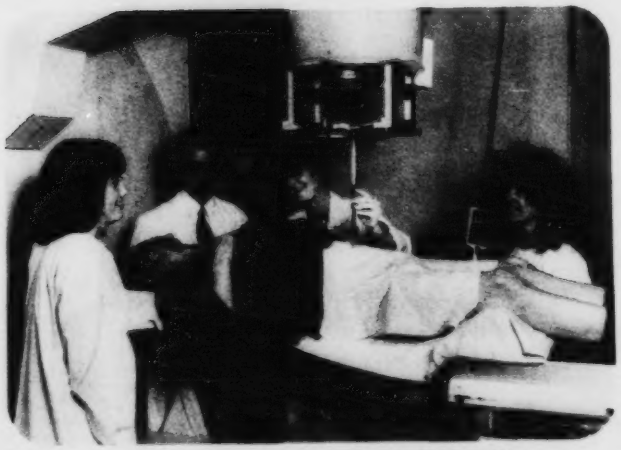
Elaine Peterson and Phyllis Davenport prepare Peter Wiebe for a CT Scan.

Kelly Lo dispenses drugs to Archibald Beveridge.

" ...feelings too of unremembered pleasure: such perhaps, as have no slight or trivial influence on that best portion of a good man's life. His little, nameless, unremembered acts of kindness and of love."
William Wordsworth
Lines: Composed a Few Miles above Tintern Abbey

"Without feelings of respect, what is there to distinguish men from beasts?"
Confucius

Dr. Plenderleith talks with Helen Schneider on the unit.

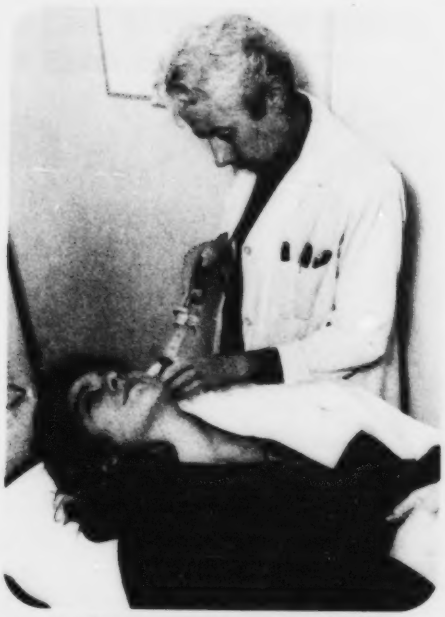


Dr. Rheaume, Alex Kruk, Dr. Ma and Lorraine Clarke position Gunnar Uhre on the simulator.

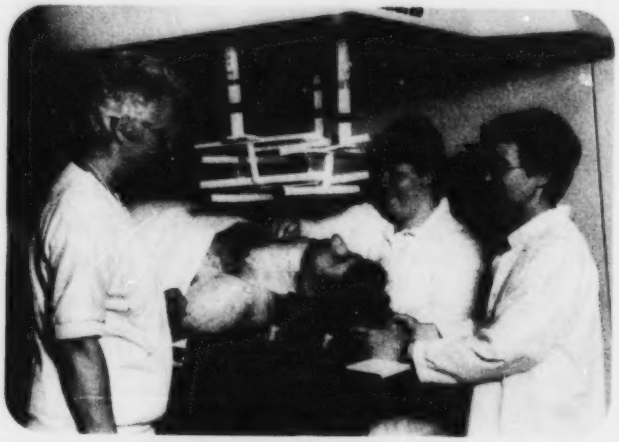
"Nobody is kind to only one person at once, but to many persons in one."
Frederick W. Faber

"Your energy can tip the scales when you add it to thousands of others - merging, slowly raising our collective consciousness to the point of power where it makes the all-important difference."

Ken Keyes, Jr.
The Hundredth Monkey



Dr. LeRiche performs a biopsy on Marina McBride.

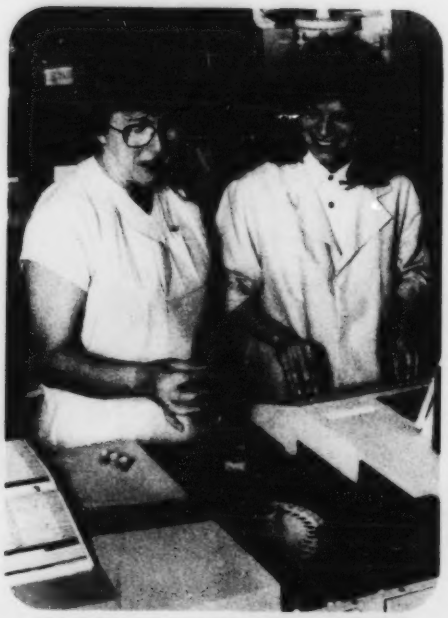


Merlyn Wenman, Suzanne Pendergast and Marilyn Davis ensure proper positioning for Nicholas Batistic on Linac 2.

"Great works do not always lie in our way, but every moment we may do little ones excellently, that is, with great love."

St. Francis de Sales

Shirley Fisher and Wendy Roberts discuss food choices.



Erika Dahlke and Louise Fridman load serum samples on a chemical analyzer.

"Kindness which is bestowed on the good is never lost."

Plato

Five-Year Financial Highlights

	1990/91	1989/90	1988/89	1987/88	1986/87
	$ 000	$ 000	$ 000	$ 000	$ 000
Expenditures					
The increase in total expenditures over the past five years shows the growing role of the Agency in assuming financial responsibility for cancer care in the province.					
Operating Fund	**$73,766**	$66,360	$59,578	$55,240	$50,303
Screening Mammography Program *	**2,490**	943	371	-	-
Investigative Grants Fund	**4,377**	3,807	3,082	3,134	2,914
Plant Fund **	**7,354**	10,291	1,566	1,345	6,508
Total Expenditures	**$87,987**	$81,401	$64,597	$59,719	$59,725
Net Operating Results					
The deficits in 1990/91 and 1989/90 are primarily attributable to a change in accounting policy, as directed by government, to provide for future retirement allowances. The deficits for the immediately preceding years were incurred as planned to utilize the accumulated surplus from previous years.					
Excess (Deficiency) of Operating Fund revenue over expenditure for the year	**$(823)**	$ (486)	$ (16)	$ (380)	$(1,080)
% of Operating Fund expenditure	**(1.1%)**	(0.7%)	(0.0%)	(0.7%)	(2.3%)

* Screening Mammography Program

The Screening Mammography Program of B.C. commenced in July 1988 with a stand-alone clinic operated by the Agency as a pilot site, with the expectation of an eventual province-wide network of clinics to be operated by an independent society.

**Plant Fund

During 1989/90, title to the land upon which the Agency's Vancouver Clinic is located was transferred to the Agency by the Province of B.C. The land has been recorded at its estimated fair market value at the time of its transfer.

Financial Statements

Condensed Statements of Revenue, Expenditure & Surplus

For the year ended March 31, 1991
with comparative figures for the
year ended March 31, 1990

		1991 $ 000	1990 $ 000
Operating Fund			
Revenue	Government grants	**$68,338**	$62,096
	Recoveries for services	**3,167**	2,847
	Investment and other income	**1,438**	931
		72,943	65,874
Expenditure	Salaries, wages and benefits	**50,776**	45,878
	Patient care	**16,266**	14,008
	Plant and support services	**6,724**	6,474
		73,766	66,360
Current year's excess of expenditure over revenue		**(823)**	(486)
Deficit, beginning of year		**(2,836)**	(2,350)
Deficit, end of year		**$(3,659)**	$(2,836)
Plant Fund			
Surplus, beginning of year		**$50,744**	$43,378
Add: Capital grants received		**7,354**	10,291
		58,098	53,669
Deduct: Depreciation		**(3,192)**	(2,925)
Surplus, end of year		**$54,906**	$50,744

Condensed Balance Sheets

as at March 31, 1991
with comparative figures as at
March 31, 1990

		1991 $ 000	1990 $ 000
Assets	Cash	**$ 4,482**	$ 3,044
	Amounts receivable	**3,709**	3,584
	Inventory of supplies & prepaid expenses	**933**	1,159
		9,124	7,787
	Buildings and equipment	**54,906**	50,744
		$64,030	$58,531
Liabilities	Accounts payable and accruals	**$12,783**	$10,623
Surplus/ (Deficit)	Operating fund	**(3,659)**	(2,836)
	Plant fund	**54,906**	50,744
		$64,030	$58,531

The information shown in the condensed financial statements is extracted from the Agency's full financial statements for the year ended March 31, 1991 on which the Agency's auditors, Ernst & Young have reported. Copies of their report and of the full financial statements are available on request.

Patient Statistics

	April 90 - March 91			April 89 - March 90		
	Vancouver Clinic	Victoria Clinic	Community Oncology Clinics	Vancouver Clinic	Victoria Clinic	Community Oncology Clinics
New Patient Examinations * (including second sites)	6,402	1,620	486	6,242	1,533	493 *
Treatments: Radiation						
Patients completed - All modalities	5,221	1,476	-	5,327	1,346	-
Fields treated						
X-rays and cobalt	140,525	41,065	-	134,245	36,324	-
Radium and caesium	494	60	-	470	38	-
Other	-	-	-			-
Total	141,019	41,125	-	134,715	36,362	-
Patient visits	65,486	20,145	-	65,654	18,271	-
Treatments: Chemotherapy **						
New Patients	843	N/A	-	N/A	N/A	N/A
Patient visits	7,555	2,734	-	N/A	N/A	N/A
Other Ambulatory Care Visits	36,187	9,138	5,113	35,326	9,076	5,235

N/A Not Available

* A new classification system was introduced in 1990/91; comparative figures for 1989/90 have been restated to conform.

** A new classification system was introduced in 1990/91; comparative figures for 1989/90 are not available.

Number of Referred Cases to the Vancouver & Victoria Clinics
January to December 1990

Site/Histology	Vancouver	Victoria
BREAST	1,253	348
ENDOCRINE GLANDS		
Thyroid Gland	30	8
Other Endocrine Glands	5	0
GASTROINTESTINAL		
Colon	248	82
Esophagus	81	15
Gallbladder & Biliary Tract	19	3
Liver	24	2
Pancreas	55	7
Rectum, Rectosigmoid & Anus	243	60
Small Intestine	5	1
Stomach	121	16
GENITOURINARY		
Kidney, Ureter, Urethra	88	16
Penis & Other Male Genital Organs	3	1
Prostate	828	228
Testicles	83	14
Urinary Bladder	112	26
GYNECOLOGY		
Cervix Uteri	104	13
Corpus Uteri (Endometrium, Myometrium)	226	28
Ovary, Fallopian Tube & Broad Ligament	140	50
Placenta (Hydatiform Mole)	6	2
Other & Unspecified Female Genital Organs	33	3
HEAD & NECK		
Eye & Lacrimal Gland	3	0
Larynx	106	19
Lip	16	2
Mouth	114	24
Nasal Cavities	12	4
Pharynx	106	21
Salivary Glands	15	3

Site/Histology	Vancouver	Victoria
LUNG, THYMUS, HEART & MEDIASTINUM		
Trachea, Bronchus & Lung	988	275
Thymus, Heart & Mediastinum	15	3
PRIMARY UNKNOWN	145	37
RETROPERITONEUM	4	1
SKIN	295	78
CENTRAL NERVOUS SYSTEM		
Brain	145	24
Other & Unspecified Parts of the Nervous System	22	0
MALIGNANT MELANOMA	280	30
MESOTHELIOMAS	10	6
RETICULOENDOTHELIAL & HEMATOPOIETIC SYSTEMS		
Hodgkin's Disease	82	12
Leukemia	108	15
Multiple Myeloma	76	26
Non-Hodgkin's Lymphoma	341	50
Other Malignant & Borderline Diseases of the Reticuloendothelial & Hematopoietic Systems	21	4
SARCOMA		
Bones, Joints, Articular Cartilage, Connective Subcutaneous & Soft Tissue	116	17
Kaposi's Sarcoma	16	3
NON-CANCER	227	19
MISCELLANEOUS	4	0
TOTALS	6,974	1,596
YOUTH CANCERS (included in above breakdown)	123	3

Ten Most Frequent Types of Cancer
(by Age & Sex)

Referred to the Vancouver Clinic in 1990

Age	0 -16		17 - 24		25 - 34		35 - 44		45 - 54		55 - 64		65 - 74		75 - 84		85 +		TOTAL		GRAND
Sex	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	TOTAL
Breast	0	0	1	0	37	0	180	1	280	0	249	2	339	2	140	1	21	0	1247	6	1253
Trachea, Bronchus, & Lung	0	0	0	0	4	0	14	8	50	58	85	181	145	238	54	138	3	10	355	633	988
Prostate	-	0	-	0	-	0	-	0	-	15	-	141	-	430	-	224	-	18	-	828	828
Non-Hodgkin's Lymphoma	2	9	4	4	6	19	19	21	17	35	27	37	36	40	32	21	4	8	147	194	341
Skin	1	0	1	0	2	2	7	11	17	14	23	32	34	61	29	34	16	11	130	165	295
Malignant Melanoma	0	1	5	3	19	20	19	33	27	24	30	29	22	25	9	10	2	2	133	147	280
Colon	0	0	0	0	2	3	6	12	19	12	38	33	36	45	19	17	3	3	123	125	248
Rectum, Rectosigmoid, & Anus	0	0	1	0	2	0	4	10	12	23	23	38	34	52	15	23	3	3	94	149	243
Corpus Uteri	0	-	2	-	3	-	14	-	39	-	55	-	83	-	23	-	7	-	226	-	226
Brain	5	14	5	7	3	10	9	10	10	9	12	16	8	19	5	1	1	1	58	87	145
Primary Unknown	1	0	0	0	0	1	3	4	6	8	18	25	24	22	13	14	2	4	67	78	145
TOTALS	9	24	19	14	78	55	275	110	477	198	560	534	761	934	339	483	62	60	2580	2412	4992
	33		33		133		385		675		1094		1695		822		122		4992		

Ten Most Frequent Types of Cancer
(by Age & Sex)

Referred to the Victoria Clinic in 1990

Age	0 -16		17 - 24		25 - 34		35 - 44		45 - 54		55 - 64		65 - 74		75 - 84		85 +		TOTAL		GRAND
Sex	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	TOTAL
Breast	0	0	0	0	4	0	37	1	60	0	95	1	101	1	39	0	9	0	345	3	348
Trachea, Bronchus, & Lung	0	0	0	0	0	1	0	2	16	14	31	39	46	65	15	39	2	5	110	165	275
Prostate	-	0	-	0	-	0	-	0	-	3	-	38	-	134	-	52	-	1	-	228	228
Colon	0	0	0	0	0	0	1	2	3	5	11	15	20	12	6	5	1	1	42	40	82
Skin	0	0	0	0	0	0	0	3	1	3	2	9	5	18	13	14	6	4	27	51	78
Rectum, Rectosigmoid, & Anus	0	0	0	0	0	2	1	0	2	3	9	10	6	13	4	8	1	1	23	37	60
Non-Hodgkin's Lymphoma	0	0	0	0	0	1	2	1	1	3	10	4	6	11	7	2	2	0	28	22	50
Ovary, Fallopian Tube, Broad Ligament	0	-	0	-	0	-	2	-	9	-	17	-	14	-	8	-	0	-	50	-	50
Primary Unknown	0	0	0	0	0	0	1	1	1	3	4	2	8	9	5	3	0	0	19	18	37
Malignant Melanoma	0	0	1	1	2	0	5	0	1	3	2	1	6	4	3	1	0	0	20	10	30
TOTALS	0	0	1	1	6	4	49	10	94	37	181	119	212	267	100	124	21	12	664	574	1238
	0		2		10		59		131		300		479		224		33		1238		

B.C. Cancer Statistics 1989

Cancer incidence and mortality for British Columbia in 1989, and data on long-term cancer trends in the province, are presented in this section.

As can be seen from the graphs on cancer trends from 1974-1989, the number of new cancers diagnosed each year is increasing by approximately 4% per year, due to the growing and aging B.C. population. The overall age-standardized incidence rate is increasing only very slowly over time.

Age-, sex-, and site-specific tables of the number and crude incidence rates of new primary cancers diagnosed among residents of the province in 1989 are included, and pie charts of the relative frequency of new cancer cases according to anatomic site and sex. The relative frequency of childhood cancers are presented separately. Corresponding tables and charts for cancer deaths among B.C. residents in 1989 are also presented. Age-standardized incidence and mortality rates for cancer by sex and anatomic site for the last five years are compared; there are minor differences between this table and figures published in earlier years, due to new information becoming available.

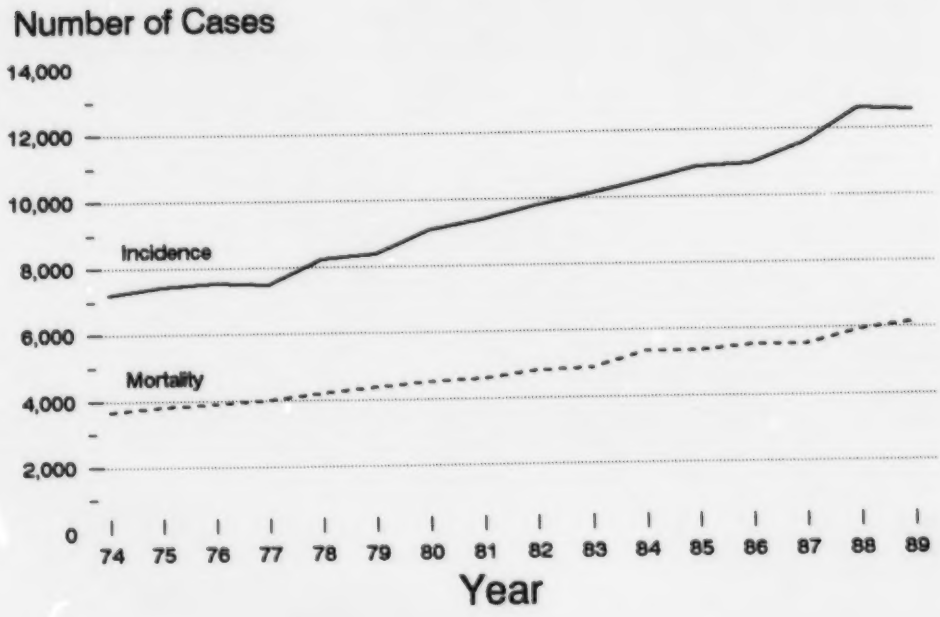
Changes of particular interest in this year's statistics are as follows:

1) The trends seen in the last couple of years for cancer of the floor of the mouth in men, and pancreatic cancer in women, seem to have reversed themselves this year, in keeping with a pattern of random changes expected in sites with small numbers.
2) The numbers of new lung cancer cases in men have declined, and in women have increased, consistent with trends predicted from smoking prevalence patterns.
3) The number of cases of melanoma has declined unexpectedly this year; data from future years is needed to determine whether this is a true change in rate.
4) The number of cases of female breast cancer has stabilized, as expected, now that the breast cancer screening programme is established. Typically a new early detection programme results in a temporary rise in numbers of cases diagnosed, since cases are being identified earlier than before.
5) The numbers of cancers of connective tissues are increasing; and unknown primary cancers have increased faster than expected in the last two years. The frequency of these cancers is being monitored.

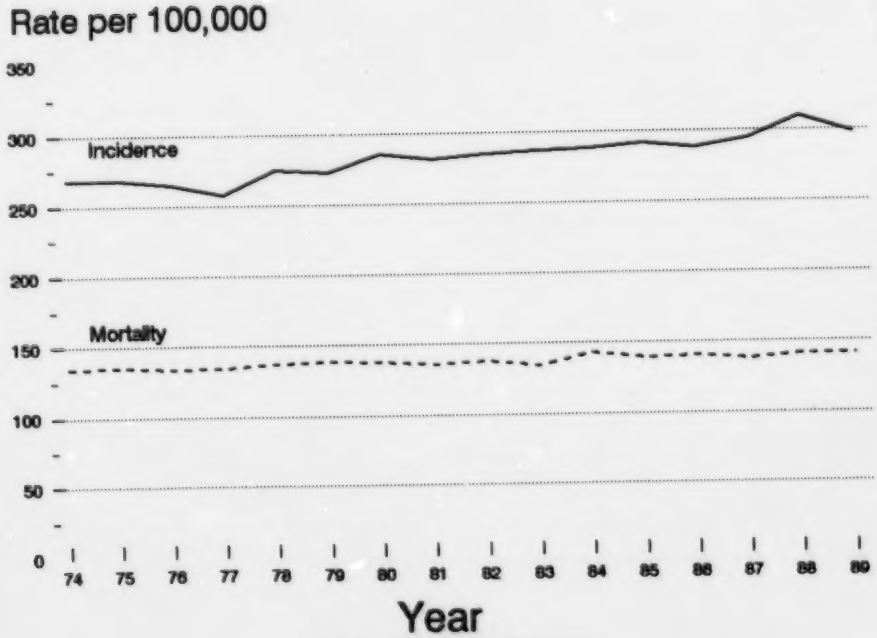
This information has been compiled from the British Columbia Cancer Registry.

[1]Age-standardized rates adjusted to the 1971 Canadian population.

Frequency of New Cancers and Cancer Deaths in B.C.,[1] 1974-1989 Male and Female Combined



Age-Standardized Cancer Incidence and Mortality Rates in B.C.,[1] 1974-1989 Male and Female Combined



1. Excludes non-melanoma skin cancers.

B.C. Cancer Statistics 1989

New Cancer Primaries by Sex & Age-Group

	0 - 34		35 - 44		45 - 54		55 - 64		65 - 74		75 - 84		85 - UP		TOTAL	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Lip	0	0	1	1	6	0	12	0	8	1	10	2	1	0	38	4
Tongue	1	1	4	2	12	5	13	7	10	9	5	7	0	1	45	32
Mouth	2	1	2	5	14	8	21	7	17	12	10	13	1	5	67	51
Pharynx	0	0	4	3	13	3	29	3	15	10	13	4	5	1	79	24
Esophagus	0	1	2	0	8	3	13	5	25	19	19	18	5	5	72	51
Stomach	2	4	6	6	17	7	49	19	84	37	58	35	12	14	228	122
Small Intestine	0	0	2	0	2	2	4	0	4	6	1	4	2	1	15	13
Colon	3	1	13	11	28	32	101	83	176	171	137	158	26	73	484	529
Rectum	2	4	12	7	31	17	76	44	146	84	81	67	19	25	367	248
Liver	0	3	3	0	6	0	19	10	23	18	13	10	4	5	68	46
Gallbladder	0	1	0	0	3	5	9	7	15	18	8	7	5	6	40	44
Pancreas	0	1	3	5	11	4	36	16	60	53	49	45	12	23	171	147
Larynx	1	1	2	1	11	1	23	4	35	8	18	7	4	0	94	22
Trachea, Bronchus, Lung	2	7	23	25	74	89	283	155	469	294	308	143	43	33	1202	746
Bone, Connective Tissue	15	15	13	7	5	4	3	6	8	10	4	6	2	4	50	52
Melanoma – Skin	18	41	32	37	29	27	38	37	34	35	21	24	3	6	175	207
Other Skin	74	65	232	210	343	277	662	463	940	664	700	509	215	221	3166	2409
Breast	0	50	1	212	1	308	3	394	3	542	3	328	0	88	11	1922
Cervix	0	28	0	38	0	21	0	21	0	16	0	9	0	7	0	140
Uterus	0	3	0	11	0	45	0	74	0	114	0	61	0	18	0	326
Ovary	0	7	0	16	0	29	0	54	0	59	0	32	0	19	0	216
Other Female Genital Organs	0	1	0	2	0	3	0	8	0	6	0	14	0	7	0	41
Prostate	0	0	0	0	29	0	262	0	698	0	587	0	146	0	1722	0
Testis	53	0	33	0	4	0	3	0	0	0	1	0	1	0	95	0
Bladder	3	1	5	0	23	4	48	14	100	24	69	29	24	16	272	88
Kidney	11	3	11	4	25	9	45	25	70	27	32	21	8	6	202	95
Brain	21	17	12	8	13	16	16	9	15	15	14	12	0	0	91	77
Thyroid	6	27	4	25	4	14	5	13	2	7	1	4	0	2	22	92
Non-Hodgkin's Lymphoma	14	13	18	14	30	24	49	36	67	69	42	46	7	23	227	225
Hodgkin's Disease	14	26	6	8	5	1	4	0	9	1	2	2	1	1	41	39
Multiple Myeloma	0	1	1	1	4	3	21	8	24	18	13	26	5	6	68	63
Leukemia: Acute Lymphatic	15	11	0	0	0	0	2	1	0	1	3	1	0	1	20	15
Chronic Lymphatic	0	1	1	2	4	2	13	6	18	14	17	5	4	10	57	40
Acute Granulocytic	5	4	1	3	4	3	5	2	6	7	7	4	1	3	29	26
Chronic Granulocytic	2	5	4	3	5	1	3	5	12	6	4	2	7	3	37	25
Other & Unspecified	3	2	2	1	3	2	10	1	10	10	9	5	5	3	42	24
Other Primary Sites	13	10	2	2	6	8	16	21	25	24	24	19	4	10	90	94
Unknown & Ill-Defined Sites	5	4	6	1	29	27	49	27	76	70	63	56	28	30	256	215
TOTAL	285	360	461	671	802	1004	1945	1585	3204	2479	2346	1735	600	676	9643	8510

B.C. Cancer Statistics 1989

Incidence Rates (per 100,000) by Sex & Age-Group

	0 - 34		35 - 44		45 - 54		55 - 64		65 - 74		75 - 84		85 - UP		TOTAL	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Lip	0.0	0.0	0.4	0.4	3.6	0.0	8.4	0.0	7.4	0.8	19.4	2.8	9.0	0.0	2.5	0.3
Tongue	0.1	0.1	1.7	0.8	7.3	3.1	9.1	4.9	9.3	6.9	9.7	9.7	0.0	4.3	3.0	2.1
Mouth	0.3	0.1	0.8	2.1	8.5	5.0	14.8	4.9	15.8	9.2	19.4	18.0	9.0	21.6	4.4	3.3
Pharynx	0.0	0.0	1.7	1.3	7.9	1.9	20.4	2.1	13.9	7.6	25.2	5.5	45.0	4.3	5.2	1.6
Esophagus	0.0	0.1	0.8	0.0	4.9	1.9	9.1	3.5	23.2	14.5	36.9	25.0	45.0	21.6	4.8	3.3
Stomach	0.3	0.5	2.5	2.5	10.3	4.4	34.4	13.3	77.8	28.3	112.6	48.5	108.1	60.6	15.1	7.9
Small Intestine	0.0	0.0	0.8	0.0	1.2	1.2	2.8	0.0	3.7	4.6	1.9	5.5	18.0	4.3	1.0	0.8
Colon	0.4	0.1	5.4	4.6	17.0	20.0	71.0	58.2	163.1	130.6	266.0	219.1	234.2	316.0	32.0	34.3
Rectum	0.3	0.5	5.0	2.9	18.8	10.6	53.4	30.9	135.3	64.2	157.3	92.9	171.2	108.2	24.3	16.1
Liver	0.0	0.4	1.2	0.0	3.6	0.0	13.4	7.0	21.3	13.8	25.2	13.9	36.0	21.6	4.5	3.0
Gallbladder	0.0	0.1	0.0	0.0	1.8	3.1	6.3	4.9	13.9	13.8	15.5	9.7	45.0	26.0	2.6	2.8
Pancreas	0.0	0.1	1.2	2.1	6.7	2.5	25.3	11.2	55.6	40.5	95.1	62.4	108.1	99.6	11.3	9.5
Larynx	0.1	0.1	0.8	0.4	6.7	0.6	16.2	2.8	32.4	6.1	35.0	9.7	36.0	0.0	6.2	1.4
Trachea, Bronchus, Lung	0.3	0.9	9.5	10.4	45.0	55.6	198.9	108.7	434.7	224.6	598.1	198.3	387.4	142.9	79.5	48.3
Bone, Connective Tissue	1.9	1.9	5.4	2.9	3.0	2.5	2.1	4.2	7.4	7.6	7.8	8.3	18.0	17.3	3.3	3.4
Melanoma–Skin	2.3	5.3	13.3	15.4	17.6	16.9	26.7	25.9	31.5	26.7	40.8	33.3	27.0	26.0	11.6	13.4
Other Skin	9.3	8.4	96.1	87.5	208.4	173.0	465.2	324.7	871.2	507.3	1359.2	706.0	1936.9	956.7	209.5	156.0
Breast	0.0	6.4	0.4	88.3	0.6	192.4	2.1	276.3	2.8	414.1	5.8	454.9	0.0	381.0	0.7	124.4
Cervix	0.0	3.6	0.0	15.8	0.0	13.1	0.0	14.7	0.0	12.2	0.0	12.5	0.0	30.3	0.0	9.1
Uterus	0.0	0.4	0.0	4.6	0.0	28.1	0.0	51.9	0.0	87.1	0.0	84.6	0.0	77.9	0.0	21.1
Ovary	0.0	0.9	0.0	6.7	0.0	18.1	0.0	37.9	0.0	45.1	0.0	44.4	0.0	82.3	0.0	14.0
Other Female Genital Organs	0.0	0.1	0.0	0.8	0.0	1.9	0.0	5.6	0.0	4.6	0.0	19.4	0.0	30.3	0.0	2.7
Prostate	0.0	0.0	0.0	0.0	17.6	0.0	184.1	0.0	646.9	0.0	1139.8	0.0	1315.3	0.0	114.0	0.0
Testis	6.7	0.0	13.7	0.0	2.4	0.0	2.1	0.0	0.0	0.0	1.9	0.0	9.0	0.0	6.3	0.0
Bladder	0.4	0.1	2.1	0.0	14.0	2.5	33.7	9.8	92.7	18.3	134.0	40.2	216.2	69.3	18.0	5.7
Kidney	1.4	0.4	4.6	1.7	15.2	5.6	31.6	17.5	64.9	20.6	62.1	29.1	72.1	26.0	13.4	6.2
Brain	2.7	2.2	5.0	3.3	7.9	10.0	11.2	6.3	13.9	11.5	27.2	16.6	0.0	0.0	6.0	5.0
Thyroid	0.8	3.5	1.7	10.4	2.4	8.7	3.5	9.1	1.9	5.3	1.9	5.5	0.0	8.7	1.5	6.0
Non-Hodgkin's Lymphoma	1.8	1.7	7.5	5.8	18.2	15.0	34.4	25.2	62.1	52.7	81.6	63.8	63.1	99.6	15.0	14.6
Hodgkin's Disease	1.8	3.4	2.5	3.3	3.0	0.6	2.8	0.0	8.3	0.8	3.9	2.8	9.0	4.3	2.7	2.5
Multiple Myeloma	0.0	0.1	0.4	0.4	2.4	1.9	14.8	5.6	22.2	13.8	25.2	36.1	45.0	26.0	4.5	4.1
Leukemia: Acute Lymphatic	1.9	1.4	0.0	0.0	0.0	0.0	1.4	0.7	0.0	0.8	5.8	1.4	0.0	4.3	1.3	1.0
Chronic Lymphatic	0.0	0.1	0.4	0.8	2.4	1.2	9.1	4.2	16.7	10.7	33.0	6.9	36.0	43.3	3.8	2.6
Acute Granulocytic	0.6	0.5	0.4	1.3	2.4	1.9	3.5	1.4	5.6	5.3	13.6	5.5	9.0	13.0	1.9	1.7
Chronic Granulocytic	0.3	0.6	1.7	1.3	3.0	0.6	2.1	3.5	11.1	4.6	7.8	2.8	63.1	13.0	2.4	1.6
Other & Unspecified	0.4	0.3	0.8	0.4	1.8	1.2	7.0	0.7	9.3	7.6	17.5	6.9	45.0	13.0	2.8	1.6
Other Primary Sites	1.6	1.3	0.8	0.8	3.6	5.0	11.2	14.7	23.2	18.3	46.6	26.4	36.0	43.3	6.0	6.1
Unknown & Ill-Defined Sites	0.6	0.5	2.5	0.4	17.6	16.9	34.4	18.9	70.4	53.5	122.3	77.7	252.3	129.9	16.9	13.9
TOTAL	36.0	46.4	191.0	279.6	487.2	627.1	1366.8	1111.5	2969.4	1893.8	4555.3	2406.4	5405.4	2926.4	638.1	551.0

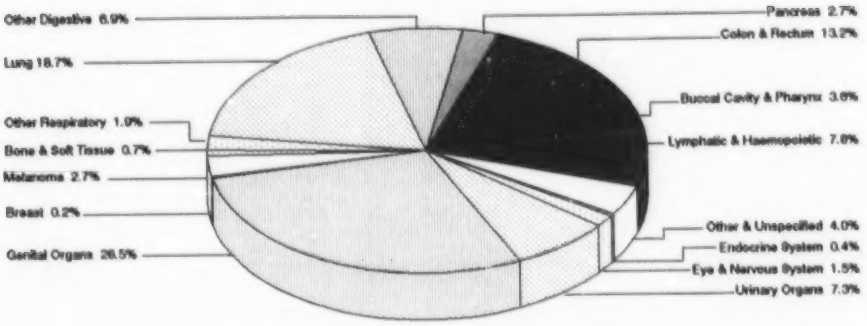
B.C. Cancer Statistics 1989

Age Standardized Incidence (per 100,000) by Sex

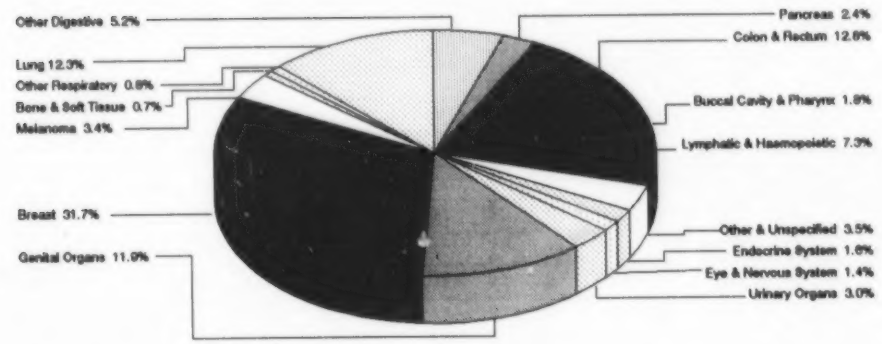
	Male					Female				
	1985	1986	1987	1988	1989	1985	1986	1987	1988	1989
Lip	2.8	2.5	1.8	1.9	1.9	0.7	0.4	0.5	0.6	0.2
Tongue	1.7	1.8	1.7	2.3	2.4	1.3	1.0	1.0	0.8	1.5
Mouth	3.5	2.9	3.3	4.3	3.4	2.7	1.5	2.5	1.9	2.4
Pharynx	4.3	4.2	4.0	5.1	4.0	1.7	1.5	1.9	1.1	1.1
Esophagus	4.5	4.6	4.4	4.3	3.4	2.1	1.5	1.7	2.0	2.2
Stomach	11.7	10.5	10.3	10.7	10.7	6.5	5.7	5.7	5.4	5.4
Small Intestine	0.8	1.1	0.8	0.7	0.8	0.8	0.6	0.5	0.5	0.6
Colon	25.6	24.3	25.4	19.5	22.5	25.2	24.2	21.8	22.9	23.0
Rectum	17.7	17.8	18.2	16.5	17.3	14.8	13.0	12.9	12.2	11.1
Liver	2.9	4.1	3.3	3.4	3.3	1.6	1.8	1.5	1.7	2.2
Gallbladder	1.3	1.9	1.5	1.9	1.9	2.0	2.6	3.2	2.0	2.0
Pancreas	8.3	8.3	7.4	7.6	7.9	6.1	6.0	7.6	8.2	6.2
Larynx	4.3	5.0	5.3	5.6	4.5	0.5	0.4	0.9	0.7	1.0
Trachea, Bronchus, Lung	60.5	58.7	59.1	60.0	56.1	27.8	30.9	32.5	33.3	35.0
Bone, Connective Tissue	3.5	3.0	1.6	2.8	2.8	1.3	2.4	2.2	2.0	3.0
Melanoma – Skin	10.5	9.4	10.4	11.5	9.0	12.8	10.3	11.1	12.8	10.7
Other Skin	138.5	139.4	150.5	147.6	152.2	103.7	104.8	112.1	119.4	112.6
Breast	0.5	0.3	0.8	0.4	0.5	84.6	82.4	80.7	97.9	93.6
Cervix	0.0	0.0	0.0	0.0	0.0	8.2	7.1	7.0	6.9	7.0
Uterus	0.0	0.0	0.0	0.0	0.0	17.3	16.1	16.5	18.4	15.6
Ovary	0.0	0.0	0.0	0.0	0.0	12.9	12.0	12.8	13.0	10.6
Other Female Genital Organs	0.0	0.0	0.0	0.0	0.0	1.8	2.2	1.9	1.4	1.9
Prostate	63.7	65.7	76.2	79.8	76.6	0.0	0.0	0.0	0.0	0.0
Testis	3.9	4.3	4.0	4.0	5.4	0.0	0.0	0.0	0.0	0.0
Bladder	13.2	13.3	12.5	13.6	12.7	4.5	4.4	4.4	4.3	3.8
Kidney	7.8	7.8	8.0	10.6	10.0	5.1	5.0	5.5	4.5	4.6
Brain	6.1	5.6	6.3	7.1	5.0	4.9	4.0	4.6	4.5	4.2
Thyroid	1.1	1.7	1.9	1.8	1.1	3.5	4.2	4.2	4.6	5.0
Non-Hodgkin's Lymphoma	11.8	12.6	11.7	13.5	11.3	8.5	8.1	8.8	9.3	10.6
Hodgkin's Disease	3.4	2.3	2.4	2.7	2.5	1.5	2.3	1.9	1.8	2.6
Multiple Myeloma	3.3	3.5	3.2	4.4	3.2	2.8	2.4	2.0	3.5	2.7
Leukemia: Acute Lymphatic	2.3	1.9	2.2	1.9	1.5	1.0	1.2	0.9	1.3	1.1
Chronic Lymphatic	2.9	3.7	3.5	2.9	2.7	0.9	2.2	1.8	1.7	1.8
Acute Granulocytic	1.1	1.2	1.6	1.5	1.5	1.3	0.9	1.1	1.0	1.2
Chronic Granulocytic	0.8	1.5	1.3	1.4	1.8	0.9	0.8	0.7	1.4	1.2
Other & Unspecified	1.7	1.9	2.0	1.6	2.1	1.2	1.8	1.3	1.3	1.1
Other Primary Sites	6.1	5.5	5.9	6.8	3.3	3.0	4.0	4.1	4.1	3.7
Unknown & Ill-Defined Sites	8.7	9.4	9.6	8.9	12.3	9.3	8.8	10.1	10.2	9.7
TOTAL	440.6	441.7	462.4	468.4	457.6	384.9	378.6	389.8	418.2	402.2

RELATIVE FREQUENCY OF NEW CASES OF CANCER DIAGNOSED IN 1989

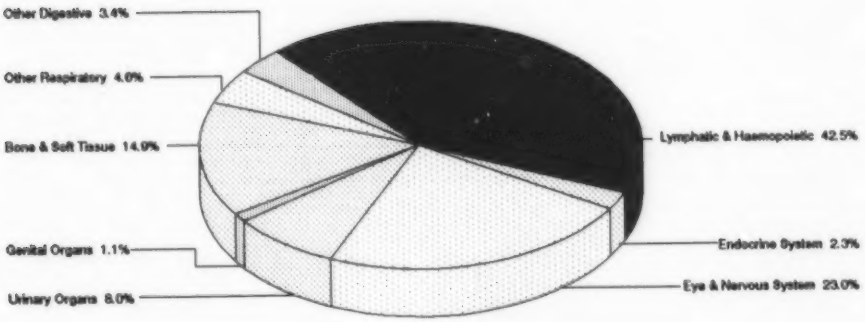
MALES 15 AND OVER



FEMALES 15 AND OVER



CHILDREN UNDER 15



B.C. Cancer Statistics 1989

Cancer Deaths by Sex & Age-Group

	0 - 34		35 - 44		45 - 54		55 - 64		65 - 74		75 - 84		85 - UP		TOTAL	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Lip	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0
Tongue	0	0	0	0	1	1	3	1	5	1	5	6	0	2	14	11
Mouth	1	0	0	0	2	0	4	0	7	3	2	4	0	5	16	12
Pharynx	0	2	5	1	4	2	15	4	11	9	4	2	3	2	42	22
Esophagus	0	0	0	0	9	2	18	3	37	13	18	13	12	2	94	33
Stomach	0	1	4	3	14	3	19	16	50	34	45	33	10	13	142	103
Small Intestine	0	0	0	2	1	0	1	0	3	2	0	1	0	0	5	5
Colon	0	0	4	1	12	13	37	32	90	68	68	60	23	51	234	225
Rectum	0	1	1	1	7	5	13	12	23	18	29	14	9	16	82	67
Liver	1	1	3	0	11	5	21	8	20	13	14	11	5	4	75	42
Gallbladder	0	0	0	0	0	4	6	8	11	12	5	7	1	8	23	39
Pancreas	1	1	0	2	6	6	42	21	58	46	46	52	13	23	166	151
Larynx	0	0	0	0	4	0	6	2	12	0	4	0	0	0	26	2
Trachea, Bronchus, Lung	3	3	15	14	68	47	249	123	410	231	268	135	53	35	1066	588
Bone, Connective Tissue	4	3	1	1	2	2	2	4	5	8	0	4	2	4	16	26
Melanoma–Skin	1	2	6	3	6	3	10	3	6	14	8	3	4	5	41	33
Other Skin	0	2	0	0	1	0	1	0	3	1	6	1	4	4	15	8
Breast	0	6	0	37	0	79	0	93	0	155	1	92	1	45	2	507
Cervix	0	3	0	5	0	4	0	6	0	9	0	9	0	10	0	46
Uterus	0	0	0	0	0	2	0	6	0	16	0	23	0	13	0	60
Ovary	0	1	0	3	0	11	0	35	0	55	0	39	0	18	0	162
Other Female Genital Organs	0	0	0	0	0	0	0	0	0	1	0	3	0	6	0	10
Prostate	0	0	1	0	2	0	28	0	116	0	188	0	83	0	418	0
Testis	2	0	2	0	0	0	0	0	0	0	0	0	0	0	4	0
Bladder	0	0	1	1	1	1	17	4	32	14	34	12	17	14	102	46
Kidney	4	0	1	3	11	2	22	5	32	7	25	13	4	2	99	32
Brain	9	10	7	7	14	9	23	10	21	19	12	18	1	3	87	76
Thyroid	1	0	1	0	0	1	0	1	2	2	1	1	0	2	5	7
Non-Hodgkin's Lymphoma	6	1	7	0	5	7	17	12	36	28	38	35	5	14	114	97
Hodgkin's Disease	1	0	0	1	4	0	1	0	2	0	0	1	2	1	10	3
Multiple Myeloma	0	0	0	1	1	2	13	6	11	13	19	27	9	5	53	54
Leukemia: Acute Lymphatic	5	5	1	1	1	0	6	0	8	6	10	6	0	9	31	27
Chronic Lymphatic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acute Granulocytic	2	7	3	4	2	0	11	7	12	10	11	3	6	4	47	35
Chronic Granulocytic	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Other & Unspecified	1	1	2	0	1	5	5	2	10	9	16	6	6	5	41	28
Other Primary Sites	1	3	2	3	7	7	22	17	32	34	34	40	15	17	113	121
Unknown & Ill-Defined Sites	0	3	3	5	7	16	33	26	41	56	51	51	16	32	151	189
TOTAL	43	56	70	99	204	239	645	467	1106	908	963	725	305	374	3336	2868

B.C. Cancer Statistics 1989

Mortality Rates (per 100,000) by Sex & Age-Group

	0 - 34		35 - 44		45 - 54		55 - 64		65 - 74		75 - 84		85 - UP		TOTAL	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Lip	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	9.0	0.0	0.1	0.0
Tongue	0.0	0.0	0.0	0.0	0.6	0.6	2.1	0.7	4.6	0.8	9.7	8.3	0.0	8.7	0.9	0.7
Mouth	0.1	0.0	0.0	0.0	1.2	0.0	2.8	0.0	6.5	2.3	3.9	5.5	0.0	21.6	1.1	0.8
Pharynx	0.0	0.3	2.1	0.4	2.4	1.2	10.5	2.8	10.2	6.9	7.8	2.8	27.0	8.7	2.8	1.4
Esophagus	0.0	0.0	0.0	0.0	5.5	1.2	12.6	2.1	34.3	9.9	35.0	18.0	108.1	8.7	6.2	2.1
Stomach	0.0	0.1	1.7	1.3	8.5	1.9	13.4	11.2	46.3	26.0	87.4	45.8	90.1	56.3	9.4	6.7
Small Intestine	0.0	0.0	0.0	0.8	0.6	0.0	0.7	0.0	2.8	1.5	0.0	1.4	0.0	0.0	0.3	0.3
Colon	0.0	0.0	1.7	0.4	7.3	8.1	26.0	22.4	83.4	51.9	132.0	83.2	207.2	220.8	15.5	14.6
Rectum	0.0	0.1	0.4	0.4	4.3	3.1	9.1	8.4	21.3	13.8	56.3	19.4	81.1	69.3	5.4	4.3
Liver	0.1	0.1	1.2	0.0	6.7	3.1	14.8	5.6	18.5	9.9	27.2	15.3	45.0	17.3	5.0	2.7
Gallbladder	0.0	0.0	0.0	0.0	0.0	2.5	4.2	5.6	10.2	9.2	9.7	9.7	9.0	34.6	1.5	2.5
Pancreas	0.1	0.1	0.0	0.8	3.6	3.7	29.5	14.7	53.8	35.1	89.3	72.1	117.1	99.6	11.0	9.8
Larynx	0.0	0.0	0.0	0.0	2.4	0.0	4.2	1.4	11.1	0.0	7.8	0.0	0.0	0.0	1.7	0.1
Trachea, Bronchus, Lung	0.4	0.4	6.2	5.8	41.3	29.4	175.0	86.3	380.0	176.5	520.4	187.2	477.5	151.5	70.5	38.1
Bone, Connective Tissue	0.5	0.4	0.4	0.4	1.2	1.2	1.4	2.8	4.6	6.1	0.0	5.5	18.0	17.3	1.1	1.7
Melanoma – Skin	0.1	0.3	2.5	1.3	3.6	1.9	7.0	2.1	5.6	10.7	15.5	4.2	36.0	21.6	2.7	2.1
Other Skin	0.0	0.3	0.0	0.0	0.6	0.0	0.7	0.0	2.8	0.8	11.7	1.4	36.0	17.3	1.0	0.5
Breast	0.0	0.8	0.0	15.4	0.0	49.3	0.0	65.2	0.0	118.4	1.9	127.6	9.0	194.8	0.1	32.8
Cervix	0.0	0.4	0.0	2.1	0.0	2.5	0.0	4.2	0.0	6.9	0.0	12.5	0.0	43.3	0.0	3.0
Uterus	0.0	0.0	0.0	0.0	0.0	1.2	0.0	4.2	0.0	12.2	0.0	31.9	0.0	56.3	0.0	3.9
Ovary	0.0	0.1	0.0	1.3	0.0	6.9	0.0	24.5	0.0	42.0	0.0	54.1	0.0	77.9	0.0	10.5
Other Female Genital Organs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	4.2	0.0	26.0	0.0	0.6
Prostate	0.0	0.0	0.4	0.0	1.2	0.0	19.7	0.0	107.5	0.0	365.0	0.0	747.7	0.0	27.7	0.0
Testis	0.3	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Bladder	0.0	0.0	0.4	0.4	0.6	0.6	11.9	2.8	29.7	10.7	66.0	16.6	153.2	60.6	6.8	3.0
Kidney	0.5	0.0	0.4	1.3	6.7	1.2	15.5	3.5	29.7	5.3	48.5	18.0	36.0	8.7	6.6	2.1
Brain	1.1	1.3	2.9	2.9	8.5	5.6	16.2	7.0	19.5	14.5	23.3	25.0	9.0	13.0	5.8	4.9
Thyroid	0.1	0.0	0.4	0.0	0.0	0.6	0.0	0.7	1.9	1.5	1.9	1.4	0.0	8.7	0.3	0.5
Non-Hodgkin's Lymphoma	0.8	0.1	2.9	0.0	3.0	4.4	11.9	8.4	33.4	21.4	73.8	48.5	45.0	60.6	7.5	6.3
Hodgkin's Disease	0.1	0.0	0.0	0.4	2.4	0.0	0.7	0.0	1.9	0.0	0.0	1.4	18.0	4.3	0.7	0.2
Multiple Myeloma	0.0	0.0	0.0	0.4	0.6	1.2	9.1	4.2	10.2	9.9	36.9	37.4	81.1	21.6	3.5	3.5
Leukemia: Acute Lymphatic	0.6	0.6	0.4	0.4	0.6	0.0	4.2	0.0	7.4	4.6	19.4	8.3	0.0	39.0	2.1	1.7
Chronic Lymphatic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acute Granulocytic	0.3	0.9	1.2	1.7	1.2	0.0	7.7	4.9	11.1	7.6	21.4	4.2	54.1	17.3	3.1	2.3
Chronic Granulocytic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.1
Other & Unspecified	0.1	0.1	0.8	0.0	0.6	3.1	3.5	1.4	9.3	6.9	31.1	8.3	54.1	21.6	2.7	1.8
Other Primary Sites	0.1	0.4	0.8	1.3	4.3	4.4	15.5	11.9	29.7	26.0	66.0	55.5	135.1	73.6	7.5	7.8
Unknown & Ill-Defined Sites	0.0	0.4	1.2	2.1	4.3	10.0	23.2	18.2	38.0	42.8	99.0	70.7	144.1	138.5	10.0	12.2
TOTAL	5.4	7.2	29.0	41.3	123.9	149.3	453.3	327.5	1025.0	693.7	1869.9	1005.5	2747.7	1619.0	220.8	185.7

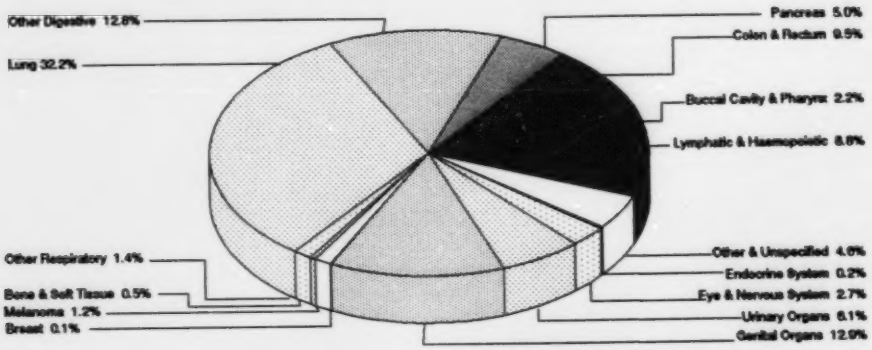
Age Standardized Mortality (per 100,000) by Sex

	Male					Female				
	1985	1986	1987	1988	1989	1985	1986	1987	1988	1989
Lip	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Tongue	0.6	1.4	0.7	0.7	0.6	0.4	0.5	0.5	0.4	0.5
Mouth	0.9	0.8	0.5	0.9	0.8	0.3	0.7	0.4	0.5	0.4
Pharynx	1.8	1.4	1.7	1.8	2.1	0.4	0.8	0.6	0.3	1.1
Esophagus	4.6	4.1	4.9	4.3	4.4	1.4	1.9	1.0	2.0	1.4
Stomach	7.1	8.3	7.0	6.9	6.6	4.8	4.0	4.4	3.7	4.4
Small Intestine	0.2	0.2	0.4	0.3	0.2	0.4	0.3	0.2	0.3	0.2
Colon	11.2	11.2	12.6	9.7	10.6	11.2	10.8	11.0	9.2	9.5
Rectum	4.3	4.1	3.8	3.8	3.8	2.9	2.6	3.5	2.8	3.0
Liver	3.1	3.2	3.3	3.2	3.7	1.2	2.2	1.6	2.0	2.0
Gallbladder	1.3	1.5	0.7	1.4	1.0	2.0	1.6	2.3	1.6	1.7
Pancreas	8.2	9.0	7.6	7.4	7.7	6.1	6.4	7.2	7.3	6.4
Larynx	1.5	2.0	1.7	1.7	1.3	0.3	0.3	0.5	0.2	0.1
Trachea, Bronchus, Lung	48.6	47.1	46.7	46.9	49.8	21.9	25.0	25.8	26.0	26.8
Bone, Connective Tissue	1.3	1.3	0.8	1.2	0.9	1.0	1.1	0.9	0.7	1.3
Melanoma – Skin	2.2	2.0	1.5	2.0	2.1	1.3	1.1	1.9	1.5	1.5
Other Skin	0.2	0.3	0.7	0.2	0.7	0.3	0.0	0.4	0.3	0.3
Breast	0.2	0.1	0.2	0.5	0.1	24.8	25.4	23.5	25.1	24.0
Cervix	0.0	0.0	0.0	0.0	0.0	2.5	2.0	1.8	2.4	2.0
Uterus	0.0	0.0	0.0	0.0	0.0	2.2	2.6	3.0	2.6	2.5
Ovary	0.0	0.0	0.0	0.0	0.0	7.3	7.9	7.8	8.7	7.3
Other Female Genital Organs	0.0	0.0	0.0	0.0	0.0	0.4	0.6	0.4	0.5	0.4
Prostate	16.3	19.0	18.4	18.2	18.1	0.0	0.0	0.0	0.0	0.0
Testis	0.4	0.1	0.3	0.2	0.3	0.0	0.0	0.0	0.0	0.0
Bladder	5.0	4.3	3.7	5.2	4.6	1.7	1.5	1.3	1.8	1.8
Kidney	3.8	3.7	3.5	4.3	4.7	1.6	2.0	2.0	2.7	1.4
Brain	5.7	4.6	5.4	5.5	4.5	3.5	2.6	3.1	3.5	3.6
Thyroid	0.1	0.2	0.2	0.0	0.2	0.4	0.1	0.1	0.3	0.3
Non-Hodgkin's Lymphoma	5.9	4.7	5.1	6.0	5.3	4.4	3.7	3.6	4.1	4.2
Hodgkin's Disease	0.2	0.7	0.5	0.2	0.5	0.6	0.4	0.2	0.1	0.1
Multiple Myeloma	2.5	2.6	2.6	2.3	2.4	2.3	2.1	1.6	2.3	2.3
Leukemia: Acute Lymphatic	0.5	0.6	0.7	1.7	1.6	0.7	0.3	0.5	1.2	1.2
Chronic Lymphatic	1.3	1.1	1.6	0.0	0.0	0.9	0.5	0.6	0.0	0.0
Acute Granulocytic	1.3	0.8	1.1	2.0	2.3	0.9	1.1	0.5	1.7	1.7
Chronic Granulocytic	0.8	0.6	0.5	0.0	0.0	0.5	0.6	0.4	0.1	0.0
Other & Unspecified	2.1	1.7	1.5	2.0	1.8	1.6	1.5	1.6	1.2	1.3
Other Primary Sites	5.5	4.5	5.3	5.2	4.4	5.4	4.7	3.6	4.7	4.9
Unknown & Ill-Defined Sites	5.9	8.6	7.2	7.3	7.0	6.3	6.8	7.0	7.9	8.3
TOTAL	154.6	156.1	152.4	153.3	154.3	124.1	125.8	124.9	129.6	128.0

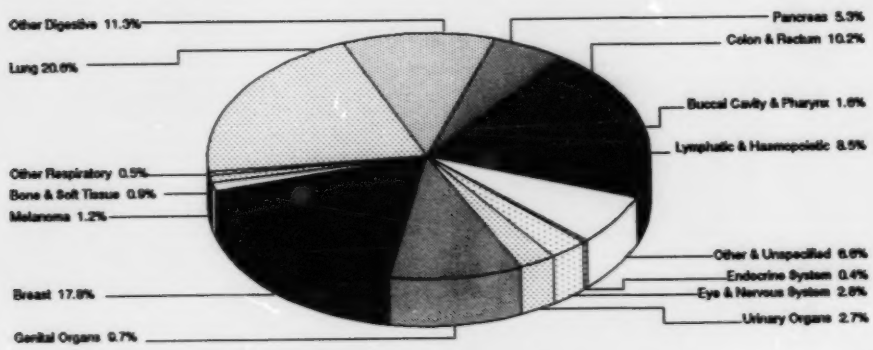
B.C. CANCER STATISTICS 1989

RELATIVE FREQUENCY OF CANCER DEATHS IN 1989

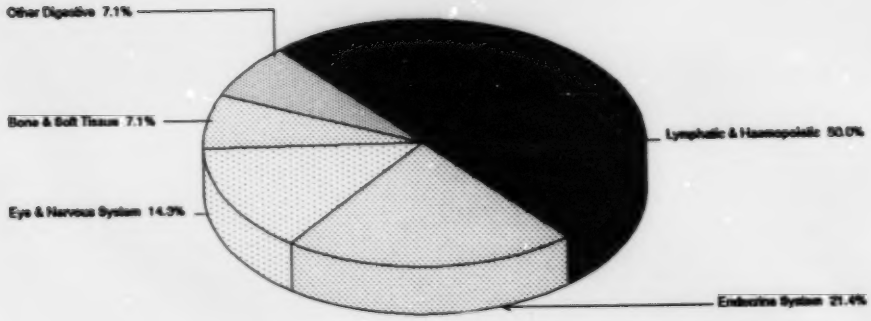
MALES 15 AND OVER

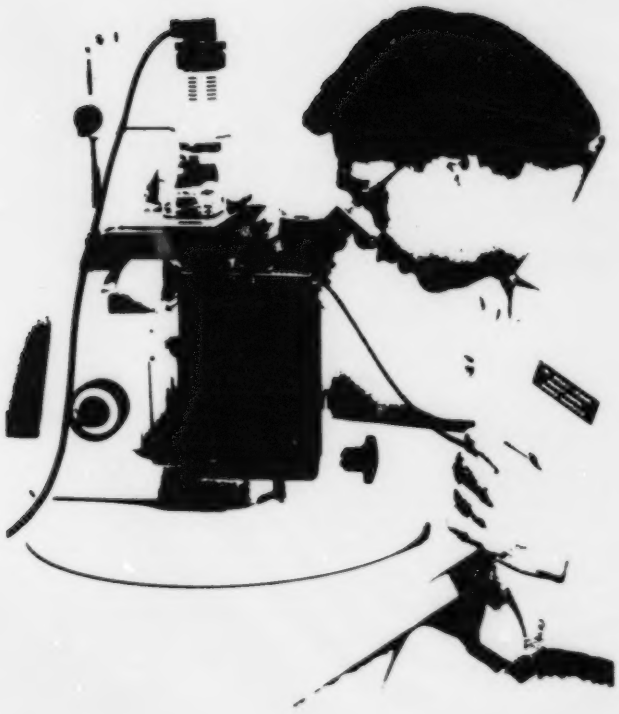


FEMALES 15 AND OVER



CHILDREN UNDER 15





British
Columbia
Cancer
Research
Centre

About The B.C. Cancer Research Centre

Cancer research is playing an increasingly important role in the diagnosis and treatment of the disease. Scientists at the British Columbia Cancer Research Centre work in close collaboration with the B.C. Cancer Agency, studying new drugs and treatment protocols, seeking improvements in radiation, chemotherapy and hormonal therapy. Other scientists study the incidence of cancer in society and in the workplace to define, if possible, particular patterns in the distribution of various types of cancer amongst the general population. Still others, working in the realm of basic research, in an attempt to unravel the mystery of how and why the disease gets started in the first place, are exploring the field of molecular genetics. Many of these research protocols are winning international acclaim for our scientists and have placed the Research Centre in the forefront of cancer research in the world.

Scientific responsibilities at the Research Centre are divided amongst six units/divisions:

Medical Biophysics Unit

Low dose radiation studies; biological effects of ionizing radiation; improvements in radiotherapy; new combinations of radiation and chemotherapy.

Epidemiology, Biometry and Occupational Oncology

Geographic mapping of cancer in B.C.; the epidemiology of breast cancer in B.C.; risk factors for melanoma; studies of cancer in the workplace.

Advanced Therapeutics

New methods of diagnosis and advances in the administration of chemotherapy; studies in the application of such immune defence modifiers as Interferon and Interleukin II.

Cancer Endocrinology

The application of hormonal therapy to various cancer sites, with particular emphasis on cancer of the prostate and breast cancer.

Terry Fox Laboratory

Studies of cancers of the blood such as leukemia and lymphomas; research into bone marrow transplantation including autologous bone marrow transplants; studies in gene transfer technology.

Cancer Imaging

The invention of solid state sensing devices coupled to computers to produce digitally generated images which are used in early diagnosis. First major advances will be in the automation of the Province-wide Pap smear program for cervical cancer and in the early detection of lung cancer. The Unit is now working to apply its technology to the early detection of breast cancer and, ultimately, to other sites.

Medical Biophysics Unit

Dr. L. D. Skarsgard

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OVERVIEW

Recurrence of tumours at the site of treatment remains an important problem in the treatment of solid tumours and is referred to as 'failure of local control'. In radiation therapy, this accounts for one third of all treatment failures, while in the remaining two thirds, treatment fails due to metastatic spread of cancer to other locations. A major part of the research effort in the Medical Biophysics Unit is directed at trying to improve the local control of tumours by radiation therapy and, in some instances, by chemotherapy. Rapidly growing solid tumours often outgrow their blood supply such that parts of the tumour become oxygen-deficient or hypoxic. Such cells are a serious problem for radiation therapy because they are very resistant to radiation. They are also resistant to some chemotherapeutic drugs. Two different possible solutions to this problem are being explored in our laboratories: one involves the use of radiosensitizers, drugs which can selectively sensitize these hypoxic cells to radiation; the other approach uses drugs which are selectively toxic to hypoxic cells, without radiation. Often, it is advantageous to use combinations of different treatments. There are several aspects which must be considered and which can be exploited in this situation: in addition to the oxygen level there are other factors in the tumour cell's environment (microenvironment) that are important to the effectiveness of treatment, such as the pH, the nutritional status, the presence of growth factors, bioreductive enzymes, etc.; in the case of a chemical agent, the question of drug penetration to the target tumour cell is an important factor which influences the effective drug 'dose' delivered to the tumour; with combination treatments that involve radiation plus drug or drug plus drug combinations, the dose, timing, frequency and sequence of the different treatments all need to be optimized for maximum therapeutic benefit. In the following section will be found brief descriptions of some of the research projects in Medical Biophysics which relate to these problems.

The pion radiation therapy program at TRIUMF continues to progress well under Dr. George Goodman's able direction. Dr. Goodman retires this year as Head of Developmental Radiotherapy and the TRIUMF clinical program and we would like to pay tribute to his many years of dedicated effort in mounting and operating that program. The fact that TRIUMF is the first of the 3 world pion facilities (the others are in Switzerland and the U.S.) to progress to randomized clinical trials (the gold standard in clinical trials) is an eloquent testimonial to the distinguished work of Dr. Goodman and his colleagues. The phase 3 trials for glioblastoma brain tumours and for prostate are progressing well and are described in more detail elsewhere in this report. Dr. Chris Fryer will replace Dr. Goodman as Head of Developmental Radiotherapy. We want to pay tribute as well to Dr. Dick Kornelsen, Head of the Physics Division, who also retires this year. Dr. Kornelsen was one of the 3 or 4 key people involved with the TRIUMF program from the very outset and he contributed much to the development and testing of the facility, which was carried out by the Medical Biophysics Unit.

Our professional staff continue to be involved in the training of residents in Radiation Oncology as well as post-doctoral fellows and graduate students in Biophysics and Pathology. Our course in Radiation Biophysics is one of the more popular 4th year courses in the Physics Department at UBC and serves as an introduction to this field for our own graduate students.

We all serve on a variety of national and international organizations, including grant review panels (NCI, MRC, SCF, NIH (US)), editorial boards, councils and committees of scientific societies, etc., and we are frequently asked to serve on review teams to evaluate research programs at other institutions.

Reports of our research have been presented at a number of national and international scientific meetings by our staff, post doctoral fellows and graduate students, often as invited speakers.

Tumour Oxygen Consumption Rates as an Indication of Tumour Hypoxia

P.L. Olive, C. Vikse and M.J. Trotter

Cells lacking oxygen are resistant to killing by radiation and some chemotherapy agents. It is therefore important to identify tumours that might benefit from treatments directed towards eliminating these hypoxic cells. While several factors are likely to influence development of hypoxia, tumours that consume large amounts of oxygen but that also have blood vessels spaced far apart are more likely to develop areas of hypoxia. Therefore a method has been developed to rapidly measure oxygen consumption rates using tiny "cubes" cut from solid tumours which are then treated with fluorescent drugs that bind only to hypoxic cells. The thickness of the unstained rim is an indication of the oxygen consumption rate of that tumour. Another fluorescent drug is used to mark tumour cells close to functional blood vessels so that the distance between blood vessels can be easily determined. By comparing intervessel distance and oxygen consumption rates, it is possible to estimate the likelihood of hypoxia for each type of tumour. Studies using several mouse tumours indicate that this approach can provide an indication of the fraction of hypoxic cells; preliminary studies with human tumours are in progress.

DNA Damage & Tumour Response to Ionizing Radiation

P.L. Olive, J.P. Banath, C.S. Toth, and D. Wlodek

DNA damage is responsible for cell killing by ionizing radiation. Several methods, some developed in this laboratory, are being used to measure DNA damage produced by low doses of ionizing radiation with the goal of understanding why some tumour cells are more sensitive to radiation than others. Results using neutral filter elution suggest that DNA conformation and association with other cellular molecules may influence the ability of a cell to repair damage. Similarly, our results show that the environment in which a cell grows appears to influence its ability to repair DNA damage, perhaps through changes in the cell cytoskeleton. The "comet" assay allows us to measure DNA single- and double-strand breaks produced by ionizing radiation in individual cells examined using a microscope. By exposing cells briefly to an electric field, small pieces of negatively-charged damaged DNA are able to migrate towards the positive pole. In unirradiated cells, the DNA is too large to migrate. Our results using the comet assay indicate that it may be possible to detect differences in cell sensitivity to killing by ionizing radiation based on two properties: initial double-strand damage to cells synthesizing DNA, and rate of rejoining of double-strand breaks. The comet assay is also being used to detect the fraction of actively growing tumour cells based on their sensitivity to etoposide, a drug which produces large numbers of strand breaks, but only in growing cells.

Drug Assessment, Mechanisms & Design

Kirsten A. Skov, Hans Adomat, Susan MacPhail, Haibo Zhou and N. P. Farrell

The overall goals of this group are to better understand the mechanisms by which clinically used drugs enhance the killing of resistant cells by ionizing radiation, and to design and assess new agents which can be used to improve radiotherapy. We focus mainly on resistance to treatment due to the presence of hypoxia, a problem in radiotherapy. However, we are also looking for compounds which act by mechanisms different from an existing drug such as cisplatin, so that they may be active in cells with acquired drug resistance, a problem in chemotherapy. These projects are funded by NCI and MRC of Canada.

An atomic absorption spectrophotometer, purchased through grants from NCI, BCHRF and HDF, is being used to quantitate the uptake of metal containing drugs in cells, in tumours and in normal tissue, and their binding to cellular components such as DNA. Assistance in the early design of our DNA binding agents through molecular modelling will also be a great asset (Workstation funded by BCHRF). Cells irradiated with doses of X-rays used in the clinic (2 Gy) are sensitized differently by various types of drugs, and these studies have been expanded to include thiol depletion and low concentrations of nitroimidazoles as well as a range of Pt complexes. U.B.C. graduate students are also actively involved in these projects: Patrick Walter (Pathology) - mechanisms of interaction between cisplatin and radiation; Don Yapp (Chemistry) - synthesis of new ruthenium complexes to bind to DNA; Grant Meng (Chemistry) - novel porphyrins designed as hypoxia selective agents; Jeff Matthews (Physics) - cisplatin and hypoxia - in vivo studies.

Common Chemotherapy Agents as Modifiers of Tumour Radiosensitivity

R. E. Durand, Nancy Lepard, Denise McDougal

This laboratory continues to utilize biophysical models and techniques in the study of tumour response to therapy. Local failure remains a major problem for radiotherapy of human solid tumours, and at least a part of tumour radioresistance is generally agreed to be linked to hypoxia. In the laboratory, however, new considerations suggest that tumour hypoxia may present a therapeutic opportunity, since the lifetime of severely hypoxic cells is presumably limited, and agents with specific toxicity to hypoxic cells have been developed.

Dr. Durand examines a flask of spheroids.

Dr. Durand's ongoing studies with spheroids in vitro, recently extended to human xenografts in vivo, have revealed that a number of agents capable of modifying tumour hypoxia are already in clinical use: common cancer chemotherapeutic drugs. Dr. Durand is testing selected drugs as radiation modifiers in human tumour xenografts in mice, by identifying time and dose schedules which produce radiosensitization, altered blood flow, metabolic perturbations leading to reoxygenation, and/or preferential cytotoxicity. The therapeutic potential of the combination treatments is assessed using fluorescence-activated cell sorting techniques to isolate and differentially study hypoxic versus aerobic cell subpopulations from the xenografts. Concurrently, drug induced changes in blood flow are quantified at the macroscopic level with laser Doppler flowmetry, and at the microregional level with image analysis techniques. Oxygen utilization rates are also measured for cells in situ using an innovative fluorescent staining procedure.

Drug Action & Interaction in a Tumour Model System

R. E. Durand, Sandra Vanderbyl, Charlene DeCoffe

Most human malignancies will respond to current chemotherapeutic treatment regimens, yet few neoplasms can be cured by chemotherapy alone. Drug "resistance" is generally implicated as a cause of treatment failure, but it is seldom possible to know when, where or why resistant cells appear in a particular patient's tumour. However, certain laboratory models, like multicell spheroids in tissue culture, are amenable to that degree of scrutiny.

Using multi-fraction, multi-agent chemotherapy protocols in rodent and human cell spheroid systems, this group is investigating 1) the role of treatment intensity, 2) effects of dose frequency, 3) the exploitability of treatment-induced changes in growth kinetics for improving treatment efficacy, 4) drug resistance as a function of treatment time and cellular location in the spheroid, and 5) drug interactions. Regional variations in drug efficacy are determined by staining spheroids with slowly-penetrating, non-toxic fluorescent dyes, then using a fluorescence-activated cell sorter to select desired cell subpopulations for clonogenicity determinations. By intercomparing cellular and molecular endpoints as a function of treatment time, mechanisms controlling the dynamic responses of the systems to common chemotherapeutic agents are determined. Drugs are chosen because of their current (or potential) use at the BCCA in clinical protocols which can accommodate sequence/schedule changes. This provides unique "feedback" whereby clinical and laboratory information is pooled and directed toward improving combination chemotherapy.

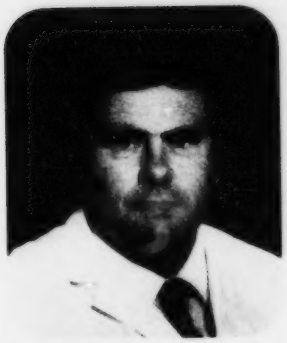
The Effect of pH & Hypoxia on the Cytotoxic Action of Chemotherapeutic Drugs

L. D. Skarsgard, D. J. Chaplin, M. Skwarchuk, A. Vinczan and J. Kristl

Recent studies in this laboratory by Dr. Chaplin have shown that effectiveness of certain chemotherapeutic agents in mouse tumours can be substantially increased if they are used in combination with a drug which reduces tumour blood flow. Two important consequences of reduced blood flow are reduced tumour oxygenation and increased acidity. The purpose of this project was to investigate the possible role of these two microenvironmental factors, hypoxia and low pH in the mechanism of this effect. The experiments are being carried out in cultured cells, where these conditions can be accurately controlled and we have examined a number of chemotherapeutic agents including melphalan, chlorambucil, mitomycin C, BCNU and flavone acetic acid. Our studies include determinations of the amount of drug which actually gets into the cell (drug uptake), and we have shown that for some drugs, uptake can be strongly influenced by pH and/or hypoxia. In the case of chlorambucil, low pH produced a 4-fold increase in drug uptake and a corresponding increase in cell killing. These investigations are related to clinical trials underway at the Vancouver Clinic, in which the possible benefit of blood flow manipulation in radio-therapy or chemo-therapy is being examined.

ACKNOWLEDGEMENTS

During the fiscal year 1990-91, the Medical Biophysics Unit staff received research operating grants from a number of sources including the National Cancer Institute of Canada, the Medical Research Council, the B. C. Health Research Foundation and the National Institutes of Health (U.S.) The total of these grants for 1990-91 was approximately $1.2 million.



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Cancer Imaging

It has long been recognized that cancerous disease can best be cured when the cancer is detected at an early, preferably pre-malignant state. The main objective of the Cancer Imaging Unit is to develop means for detection and localization of pre-cancerous lesions and early cancers which can then be treated by existing techniques. Such a procedure has been shown to yield excellent chances for a complete cure for virtually all tumor types.

Over the past years the scientists and engineers of Cancer Imaging Unit have developed several apparatuses, some of which have already been used in clinical settings. For example, the Lung Imaging Fluorescence Endoscope (LIFE) is a device which makes (otherwise) invisible cancerous growths in the lung appear bright red on a green background when viewed on a computer monitor. Measuring lung tissue autofluorescence in patients, it was discovered that spectral characteristics of pre-cancerous and cancerous tissues differ significantly from those of normal bronchial tissue. Autofluorescence of lung tissue, even when excited by a laser light, is so weak that no human eye can see it. Employing ultrasensitive cameras, the autofluorescence can be amplified and made visible on a video monitor. However, to differentiate between normal and cancerous tissue, enhanced images must first be processed by computers, using sophisticated mathematical transformations. If done correctly, pseudo (computed) images can clearly delineate pre-cancerous and cancerous growth, even as small as one millimeter in diameter and only a few cell layers in thickness.

Several different prototypes of LIFE have already been developed, all of which have proven useful in experimental clinical use. To date, over 150 lung patients were examined using LIFE and a number of x-ray occult cancers have been discovered. For example, 82 high risk individuals, working in an environment which renders them susceptible to lung cancer, have been examined. In nearly 25% of the subjects, pre-cancerous lesions were discovered ranging from mild to severe dysplasia; in two individuals, carcinoma *in situ* (CIS) was discovered. These patients were subsequently treated with excellent prognosis for a complete cure.

In the fall of 1991, another major research and development effort will culminate in a clinical device. The Automated Cervical Cell Screening System (ACCESS) is being developed as a helper tool for cytotechnicians who screen cervical smears for the presence of pre-cancerous and cancerous cells. In BCCA alone, over 2,500 cervical samples are examined daily to mass screen women of British Columbia for cervical cancer. During the past 25 years, this method has proven to be the most effective way to control this disease. Today, B.C. women have the lowest mortality rate caused by cervical cancer of all developed countries in the world.

To continue this work effectively and to achieve even better detection means, a fully automated pre-screening device is being developed. The ACCESS apparatus employs computer vision and artificial intelligence to look at cervical cells in conventionally deposited smears. After detecting and measuring several hundred individual cells, the device decides without human intervention whether the sample must be further examined by cytotechnicians and cytopathologists. To perform this task a novel quantitative microscope (also referred to as the Solid State

Microscope - SSM) had to be invented, developed and built. This goal was achieved by Cancer Imaging staff in collaboration with scientists and engineers of Xillix Technologies Corp. of Vancouver, B.C.

Numerous other programs are underway which are now at different stages of development. For example, a digitizing mammography device is being developed which will help radiologists evaluate microcalcifications detected in mammograms. Microcalcifications are early indications of potential malignant growth in the breast tissue. Another project related to breast tissue involves researching means to objectively evaluate malignant potential of early breast cancer. Skin cancer, such as malignant melanoma, can also be better detected and evaluated from optical properties of normal and cancerous moles. Graduate students and scientists of Cancer Imaging are developing a process to measure the differences between normal and diseased tissue for diagnostic and prognostic purposes.

When an early lesion is detected it must be eradicated. Until recently, surgery has been the most widely used method. Although effective in many cases, it greatly affects the subsequent quality of the patient's life. For many of these lesions, a novel method has been suggested, photodynamic therapy (PDT), which employs tumor localizing drugs. These can be activated (made toxic) when exposed to light. Neither light nor photosensitizing drugs alone are toxic to human tissue. By concentrating the drugs and the light exposure to the tumor site only cancerous tissue is affected, leaving minimal damage to the surrounding normal tissue. Cancer Imaging staff is actively researching ways to apply this method to treat patients with early cancers.

Over the years the Cancer Imaging Unit has developed numerous sophisticated devices which have been employed in measurements of biological, physical and chemical properties of cancerous cells and tissues. In addition to the scientific staff of Cancer Imaging and other Research Units in the B.C. Cancer Research Centre, many scientists throughout the world have been taking advantage of these devices. At any given time, a number of guest scientists perform experiments in the Cancer Imaging laboratories which can only be made in Vancouver due to the presence of this technology. On many occasions, we have been requested to duplicate these apparatuses and send them to other cancer research institutions throughout the world.

In addition to the scientific staff of Cancer Imaging as listed above, these achievements could not be possible without close collaborations with oncologists and consultants of BCCA (Dr. Jean LeRiche, Dr. Jasenka Matisic, Dr. George Anderson, Dr. David McLean, Dr. Jackie Morgan-Parkes, Dr. Vivien Basco and others); numerous post-doctoral fellows and graduate students (Dr. Ingrid Spadinger, Dr. Neal Poulin, Jaclyn Hung, Farzin Aghdasi, Dr. Barbara Susnik, Haishan Zeng, Gorazd Krosl); technicians (Alan Harrison, Jagoda Korbelik, Alfred Pon, Nick MacKinnon) and secretaries (Vel Kinnie, Gloria Schunter, Susan Grose). Close collaboration with a Vancouver based research and development company, Xillix Technologies Corp., specifically incorporated to help achieve the goals of Cancer Imaging and BCCA, allowed industrial and matching government funds to supplement conventional scientific grants. Xillix scientists, engineers and technicians deserve equal credit for the LIFE, ACCESS and SSM projects. They will undoubtedly play an even greater role in the future when these devices will be installed for routine clinical work at BCCA and elsewhere. Finally, every year there are at least five summer students employed and trained in various scientific disciplines. Their contribution must also be acknowledged.

The Automated Cervical Cell (Pre) Screening System (ACCESS) laboratory prototype is being tested by Dr. David Garner (chemistry) and research technicians, Alan Harrison and Kim Yip. The MicroImager 1400 used in this system was designed and developed in Cancer Imaging's laboratories.

Terry Fox Laboratory

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OVERVIEW

The overall goal of the research programs ongoing in the Terry Fox Laboratory is to improve the diagnosis and treatment of cancer, with primary emphasis on leukemia and other malignancies of the blood-forming system. To achieve this goal, a multi-disciplinary group of laboratory cancer researchers and physicians of the Leukemia/Bone Marrow Transplant Program have been brought together under one administrative structure. As a result, advances made in the laboratory are moved quickly into the clinic. Conversely, patient blood and marrow specimens needed for laboratory research are readily available. This continuous interchange of materials and ideas fosters a unique collaborative spirit which helps mold research priorities and stimulates new initiatives in both basic and applied areas.

More than 100 people are now involved in research projects in the Terry Fox Laboratory. A major part of the operating costs and some equipment to undertake these projects comes from a prestigious 5 year Group grant from the National Cancer Institute of Canada. The remaining support has been provided by grants from the Medical Research Council of Canada, the British Columbia Health Research Foundation, and the National Institutes of Health (USA). The total amount of funding received from outside peer-reviewed sources in 1990-91 was ~$2,800,000 and for 1991-92 already exceeds $3,000,000.

Several Senior Staff hold highly competitive career awards for salary support from the National Cancer Institute or the Medical Research Council of Canada. We are particularly pleased this year to acknowledge the new receipt of such an award from the National Cancer Institute to Dr. Graeme Dougherty who joined the Senior Staff of the Terry Fox Laboratory in April 1991. Salary support for the other Senior Staff is provided by the British Columbia Cancer Agency, the Vancouver General Hospital, and the University of British Columbia.

Important to the high level of research productivity maintained in the Terry Fox Laboratory throughout the last year has been a group of approximately 60 outstanding trainees including postdoctoral fellows, graduate students, and undergraduate students, half of which (31 in all) obtained their own salary support in the form of competitive independent awards from agencies such as the National Cancer Institute of Canada, the Medical Research Council, the National Science and Engineering Research Council, the University of British Columbia (Graduate Fellowship Program), the British Columbia Cancer Foundation (Summer Studentship Program), and l'Association pour la Recherche contre le Cancer (France). Teaching forms an integral part of the research activities in the Terry Fox Laboratory and an expanded emphasis on the training of new cancer research scientists has been developed in response to recent governmental projections of increasing numbers of cancer patients and insufficient numbers of trained biomedical investigators in the near future.

CELL CULTURE LABORATORY

Dr. C. Eaves

Experiments in this laboratory and elsewhere have established the existence in adults (both mouse and man) of a very primitive blood-forming (stem) cell capable of regenerating all cells in the blood and marrow following transplantation. Quantitative methods for assessing these cells have not been available and development of appropriate procedures for this has become a major focus of the efforts of this laboratory.

Two years ago we described a limiting dilution assay that for the first time allows mouse totipotent long-term repopulating cells to be quantitated with a high degree of specificity and precision. We are now using this in vivo transplantation assay to define the growth factor requirements of the cells it detects. One lead has been provided by studying the ability of these cells to be sustained in long-term marrow cultures. Ongoing investigations, in collaboration with other senior staff of the Terry Fox Laboratory, are focussed on the purification of this cell to homogeneity and further analysis of the molecular and cellular mechanisms that regulate its turnover, expansion, maturation, and transformation to a cancerous state.

We have also developed a quantitative assay for an analogous human cell detected by virtue of its ability to repopulate long-term cultures. Current investigations are continuing to characterize this human "long-term culture initiating cell", to define conditions required for its expansion in vitro and to explore its potential for producing lymphoid as well as myeloid progeny. This latter goal is dependent on the current development of a new system for supporting the earliest stages of human lymphopoiesis using genetically immuno-compromised "Scid" mice as recipients of human marrow transplants.

Studies to define the molecular interactions required for the production and differentiation in vitro of pre-B cells are also underway. Evidence for a new growth factor involved in the generation of B lymphocyte precursors has been obtained. The role of specific growth factors and certain cell adhesion molecules in the regulation of early mouse and human pre-B cell development is also being analyzed.

LEUKEMIA LABORATORY

Dr. A. Eaves

Cancers of the blood differ from one another in a number of fundamental biological parameters, including the nature of the cell initially transformed, the particular oncogenes involved, how responses to growth regulators may be altered, and changes affecting the ability of the transformed cells to undergo terminal maturation. Nevertheless all hemopoietic malignancies appear to represent the clonal amplification of single cells. The research objectives of this laboratory are to develop culture systems that will allow leukemic cells to be analyzed and eventually manipulated under defined conditions. At present efforts are focussed on progenitor cells from patients with polycythemia vera, chronic myeloid leukemia, essential thrombocytosis, and the myelodysplastic (pre-leukemic) syndromes. One of these culture systems is now being evaluated as a method to separate normal stem cells away from contaminating leukemic cells for the purpose of autologous bone marrow transplantation ("culture purging"). The potential mechanisms by which growth factor therapy in vivo enhances hematologic recovery after bone marrow transplantation has also been studied. In the past year, a new in vitro assay that makes it possible to quantitate and characterize leukemic stem cells from patients with chronic myeloid leukemia has been developed. This assay is now being used to investigate subtle differences between normal and leukemic stem cells which may help to explain some of the abnormal growth characteristics of leukemic stem cells and facilitate their separation from normal stem cells for autografting purposes.

TRANSPLANTATION BIOLOGY LABORATORY

Dr. H. Klingemann

Bone marrow transplantation (BMT) allows the cure of a substantial proportion of patients with hematological diseases. In the remainder relapse is the major problem, indicating that treatment protocols are still not adequate in many cases. Relapse rates tend to be higher when autologous (the patient's own) marrow is transplanted than when allogeneic marrow (from a family member or unrelated person) is used. However, in the latter case, significant graft-versus-host disease (GVHD) frequently develops. On the other hand, GVHD provides some anti-leukemia (graft vs. leukemia-GVL) effect, thereby accounting for the lower relapse rates characteristic of patients who exhibit GVHD.

A major objective of this laboratory is to develop clinically practical strategies to overcome residual disease in patients treated with marrow transplant protocols. Current experiments using a mouse model are being directed at dissecting GVHD and GVL mechanisms. We are also exploring new strategies for delivering tumor necrosis factor (TNF-α) locally to the bone marrow to eliminate residual leukemia.

Natural killer (NK) and lymphokine-activated killer (LAK) cells are also capable of mediating anti-leukemia activity. We have just completed preclinical studies suggesting the feasibility of inducing "LAK cell killing" of leukemic cells in clinical autologous marrow transplants by in vitro incubation of the marrow with Interleukin-2 prior to transplantation and clinical trials are just starting. We are also trying to isolate, clone and manipulate donor-derived NK cells from recipients after BMT to test whether they can kill autologous leukemic cells. This cell population might then be considered as a target for future immune transplant and gene transfer experiments.

MOLECULAR GENETICS LABORATORY

Dr. K. Humphries

The focus of our research is on the exploitation of recombinant DNA and gene transfer techniques to define properties of primitive blood stem cells and their molecular growth needs. Long-term goals are to develop new approaches for enhancing or inhibiting stem cell growth, to understand the regulatory defects that underlie leukemia, and to develop protocols for the clinical use of genetically manipulated marrow stem cells.

We are currently using recombinant retroviruses as gene transfer "vectors" to genetically mark blood cell precursors (fate mapping) and to examine the function of putative regulatory genes. We have demonstrated effective gene transfer to highly purified and very primitive blood repopulating cells isolated from mouse bone marrow and have used gene transfer to show for the first time that such cells can proliferate under certain conditions in culture. Efforts are now focussed on identifying the molecules that produce this proliferation. Progress has also been made in establishing techniques for high efficiency gene transfer to the most primitive class of human blood cells that can currently be detected. Strategies for further increasing gene transfer efficiency are being evaluated. Retroviral marking is also now being combined with long-term cultures to better determine the proliferative potential and behavior of primitive blood cells from both normal individuals and patients with chronic myelogenous leukemia. This work will provide a basis for plans to mark bone marrow cells prior to transplantation in order to gain insight into the origin of stem cells involved in normal blood cell recovery and in disease recurrence in patients. New work is aimed at developing and using vectors that carry genes to study leukemic transformation.

Ongoing efforts to explore the function of new regulatory genes recently discovered within the Terry Fox Laboratory are currently under study. The effect of abnormal expression of one of these genes in mature T cells is being tested in transgenic mice using the transgenic mouse facility recently established in the Terry Fox Laboratory. We are also attempting to apply this technique for gene transfer to somatic cells, in particular hemopoietic stem cells and stromal cells.

MOLECULAR ONCOLOGY LABORATORY

Dr. D. Hogge

Our goal is to understand the regulatory mechanisms that govern normal hemopoiesis and the abnormalities that result in leukemic transformation. To this end, we have used retroviral-mediated transfer of genes for human hemopoietic growth factors to engineer cells which constitutively produce high levels of specific factors. Interleukin-3-producing primitive hemopoietic cells that respond to, but do not normally produce this factor have thus been made. The effect of this autocrine phenotype on the growth potential of the engineered cells is now being examined in culture and in mouse models of human leukemia.

Marrow stromal feeder cells have also been engineered to continuously produce high levels of various regulatory factors. Some of these "feeders" have been shown to have enhanced ability to support the growth of primitive normal hemopoietic cells. Similar studies with malignant hemopoietic cells are now underway. In collaboration with others at the Terry Fox Laboratory the technique of retroviral gene transfer is being applied to the marking of primitive human hemopoietic cells in order to follow their fate both in vitro and following transplantation into irradiated mice. These studies are the forerunners of clinical trials involving gene transfer which are now being designed and which will be aimed at improving the results of marrow transplantation in man.

CRYOGENIC LABORATORY

Dr. P. Lansdorp

Blood cells have a limited life span and need to be continuously replaced by newly produced blood cells that are ultimately derived from pluripotent hemopoietic stem cells. Stem cells are thus defined retrospectively by their ability to generate blood cells of multiple differentiation lineages and sustain long-term hemopoiesis after bone marrow transplantation. The primary goal of research activities in the Cryogenic laboratory is to isolate stem cells for direct analysis of their biological properties. This knowledge will be used to develop new therapies based on transplantation of defined hemopoietic cell populations.

CD34 is a glycoprotein which is expressed on only a few percent of all bone marrow cells, including all immature hemopoietic precursor cells. Fluorochrome-labeled antibodies against CD34, as well as other monoclonal antibodies developed in our laboratory, are being used to follow the early events in primitive (CD34+) hemopoietic cell differentiation. Stem cell "candidates" are being isolated using the FACStar^X cell sorter and their development followed in culture by clonal analysis of individually sorted cells, time lapse video, and assessment of the effects of various growth factors. The results of these studies provide information on the relationship between stem cells and more differentiated cells and the possibility of expanding normal stem cells in culture.

Our efforts in stem cell purification have also been directed at a large-scale technique suitable for clinical use. CD34+ cells have been bound to very small magnetic particles and separated using a high gradient magnetic filter. We are collaborating with other colleagues in the Bone Marrow Transplantation Program and the Terry Fox Laboratory to develop new therapies based on transplantation of purified stem cells. In principle, use of these cells offers a means of avoiding the problems of contaminating tumour cells in autologous transplants or contaminating lymphocytes in allogenic transplants. Autologous stem cell transplantation will be first evaluated in selected patients with non-Hodgkin's lymphoma. Transplantation of allogeneic stem cells will be tested in a mouse model. Eventually, we plan to use purified stem cells as target cells in clinical gene transfer experiments.

IMMUNOLOGY LABORATORY

Dr. F. Takei

Lymphocytes play a central role in the immune system. However, most lymphocytes are found in a "resting" state. They are activated and become "functional" only after they encounter specific antigens. The long-term goal of our research is to understand the mechanisms that regulate the generation of functional T cells and eventually to manipulate immune responses for therapeutic advantage.

One of our projects is focused on a pair of lymphocyte surface proteins termed LFA-1 and ICAM-1. These two molecules represent a receptor/ligand pair and mediate certain cell-cell interactions which are essential for the development of various immune responses. Currently we are investigating the biochemical and molecular mechanisms including signal transduction pathways that regulate the LFA-1/ICAM-1 mediated cell adhesion and detachment using genetically engineering forms of ICAM-1 and LFA-1.

We have also discovered a unique population of lymphocytes which carries normal receptors for antigens but does not express the "co-receptors" required for activation. These lymphocytes respond to IL-7 by expressing hormone-like factors that can activate other lymphocytes. We believe that this pathway of lymphocyte activation may be involved in a variety of immunological disorders including autoimmune disease. We are currently studying their role in normal and abnormal immune responses.

GENE FUNCTION LABORATORY

Dr. G. Dougherty

Adhesive interactions between primitive hemopoietic cells and bone marrow stromal elements (fibroblasts, endothelial cells, adipocytes and the extracellular matrix components produced by these cells) play an essential role in regulating hemopoiesis. The main aim of our research is to identify and characterize the cell surface proteins that mediate such adhesive interactions and determine the possible role that alterations in either the expression or functioning of these molecules may play in the development and/or pathogenesis of hematological malignancies. Initial efforts have focussed on the hyaluronic acid-binding protein CD44. CD44 is highly expressed on human hemopoietic precursor cells and monoclonal antibodies directed against this molecule have been shown to inhibit both lymphopoiesis and myelopoiesis in murine long-term marrow cultures. We have raised several monoclonal antibodies against human CD44 and have cloned two novel isoforms of this protein that appear to be preferentially expressed on primitive hemopoietic cells. Presently we are attempting to define further the molecular mechanisms that regulate the functional activity of these CD44 isoforms. In particular we are investigating the nature and importance of proposed interactions between CD44 and other cell surface and cytoplasmic proteins.

Dr. Keith Humphries (lt) and Dr. Peter Lansdorp (rt) discuss their collaboration on gene transfer into purified marrow stem cells. One project is to genetically engineer normal marrow stem cells to enhance the resistance of blood cells to chemotherapy and thereby improve the treatment of many types of cancer.

BIOCHEMISTRY LABORATORY

Dr. G. Krystal

It is now well established that cancer results from mutations in genes that normally regulate cell growth and differentiation. It is therefore essential, in order to understand how cancer arises, to define the molecules that regulate normal cell growth and differentiation and how they work. Exhaustive research in this area has shown that this is carried out by growth factors. Over the last decade, more than a dozen hemopoietic growth factors have been cloned and characterized in some depth. These factors exert their effects by binding to and changing the shape of specific high affinity receptors on the surface of responsive target cells. Recently, many of these receptors have been cloned and found to share structural features suggestive of a common ancestral origin. Interestingly, unlike many growth factor receptors which possess intrinsic tyrosine kinase activities that become activated when growth factors bind, these hemopoietic growth receptors all lack tyrosine kinase domains.

A major goal of the research in this laboratory is to delineate the mechanisms of signal transduction utilized by this new receptor family in order to assess ways in which a normal blood-forming cell may become malignant. An approach we are taking is the isolation of proteins that become physically associated with a given receptor upon ligand binding. This strategy is currently being applied to receptors for erythropoietin and Interleukin-3. We are also preparing mutant receptors (muteins) for these two hemopoietic growth factors to determine which amino acids may be crucial for signal transduction.

GENE REGULATION LABORATORY

Dr. R Kay

Cellular proliferation and differentiation occurs in response to complex networks of external signals and internal programs of gene activation and repression. Malignant transformation is due to the failure or hyperactivation of one or more of these signalling networks, as a consequence of genetic mutation. Understanding the normal control mechanisms of cell growth and differentiation at the genetic level is essential to understanding how malignant transformation initiates and progresses. The genes involved in these processes, and the proteins that they encode, are being identified and studied in this laboratory.

cDNAs encoding cell surface proteins with potential roles in controlling or modulating the responses of hemopoietic cells to external stimuli have been isolated by immunoselective expression cloning. cDNAs for the murine M1/69-J11d differentiation antigen and its human homolog, CD24, are among the clones obtained by this method. Functional studies are now underway to determine how these small, glycolipid-conjugated proteins can influence the developmental fate and activation responses of T and B cells.

cDNA library expression is also being used to clone genes that can reprogram the proliferative or differentiative capabilities of cells. This approach provides a direct means for identifying the genes that have a commanding role in the commitment of cells to specific developmental pathways. It also has the potential to identify oncogenes that are responsible for the failure of regulated cell growth in transformed cell lines and primary malignancies.

MOLECULAR BIOLOGY LABORATORY

Dr. D. Mager

The overall goal of this laboratory is to analyze molecular processes involved in gene regulation and genetic abnormalities. Currently, a major aim is to determine the impact that endogenous retrovirus-like sequences or retrotransposons have on the human genome. Retrotransposons frequently cause both insertional gene mutations and other rearrangements in lower organisms. In humans, DNA sequences which resemble retrotransposons comprise at least 10% of the genome and it has been postulated that their rearrangements contribute to aging, malignancy and birth defects.

Much of our present research is focussed on a large family of human retrovirus-like elements termed RTVL-H. Studies on the expression of RTVL-H sequences during development and malignancy and on the identification of potential protein products are underway. In addition, regulatory sequences in RTVL-H long terminal repeats (LTRs) are being analyzed. Several cellular human genes that are regulated by RTVL-H LTRs are now being characterized. In other studies we are analyzing the apparent association between a cluster of RTVL-H elements on the long arm of chromosome 7(7q) and 7q deletions in leukemia, and we are developing strategies to detect new insertional events in human cells.

A joint study with Dr. Fumio Takei in the Terry Fox Laboratory is also in progress to isolate human genes related to a mouse multi-gene family that is expressed in natural killer T cells and in malignant T cell lines.

Dr. Michael Barnett (lt), Dr. Gordon Phillips (tr), and Dr. Connie Eaves (seated) are working together on the use of "culture purging" and autologous bone marrow transplantation to treat patients with leukemia. Twenty patients with chronic myelogenous leukemia have been treated to date and the results are very encouraging.

Cancer Endocrinology

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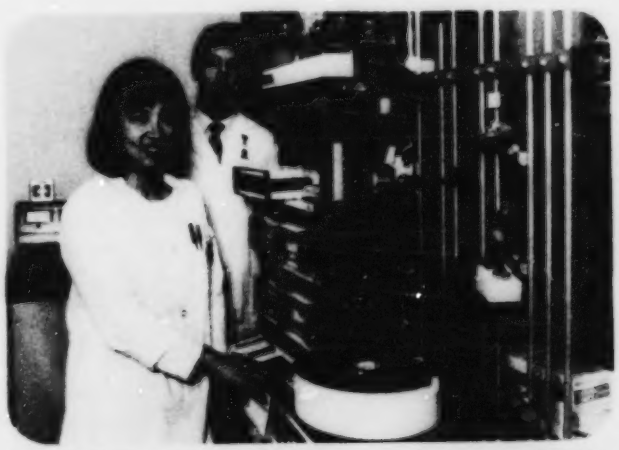

Dr. Nicholas Bruchovsky and visiting MD, Sanae Akakura of Chiba University, Chiba city, Japan, using the Fast Protein Liquid Chromatography system. Cellular components from parent, regressed and recurrent tumors of the transplantable SC-115 androgen-dependent mouse mammary carcinoma are analyzed to gain insight into the molecular mechanisms involved in tumor progression.

The function of this department is to evaluate the results of hormonal therapy, to make recommendations concerning the future use of hormones and to develop new ways of employing hormones and other endocrine therapies for the management of cancers of the breast, prostate and endometrium. The department is also active in providing technologies for oncogene diagnosis and related molecular changes in breast cancer and malignant melanoma. Presenting a major challenge to the resources of the BCCA, cancers of the breast and prostate are characterized by their high incidence and growing prevalence. Currently, there are approximately 12,000 women with breast cancer and 7,000 men with prostate cancer in B.C. In addition about 2,000 new cases of breast cancer and 1,900 of prostate cancer are diagnosed each year (1988 statistics); due to demographic changes in the population the number of new cases is expected to increase by about 50% in the next decade. The majority of such patients will receive some form of endocrine therapy during their treatment history. Also such therapy may be initiated sooner owing to the introduction of sophisticated new technologies which assess the potential danger of premalignant conditions and the risk of metastatic disease in early malignancy. The department has made a major commitment to the development of such procedures which, when implemented, will enhance the medical and economic benefits of future therapies. More emphasis will be placed on prevention of malignant progression and early intervention - therapeutic refinements which should help to check rising prevalence rates. The track record of the department includes the successful development of cost-effective drug combinations and regimens for the treatment of prostate cancer which have reduced the cost of treating this disease. Recent cloning of a melanoma-specific receptor gene has enabled the development of anti-receptor antibodies opening the door to earlier and improved diagnosis of malignant melanoma. The department also serves as the world reference centre for the Nb Bioassay of prolactin mitogenic activity.

The clinical aspects of the Cancer Endocrinology program are offered through the existing service structures of the Division of Medical Oncology.

In parallel, related, basic and applied investigations into the mode of action of hormonal agents and growth factors have been undertaken. Several such projects are ongoing and include the following:

1. Control of neoplastic growth by androgens and other hormones.
2. Use of anti-androgens in the treatment of advanced prostatic carcinoma.
3. Evaluation of genetic markers of hormone and drug resistance in breast cancer.
4. Evaluation of risk of malignancy using flow cytometry and oncogene screening.
5. Development of antibodies for the diagnosis of early melanoma.
6. Structure-function analysis of prolactin, a pituitary hormone which is a growth factor for certain breast cancers and lymphomas.
7. Investigation of the biochemical, chromosomal and molecular genetic changes occurring in malignant lymphomas as they progress from a dependency on hormones for growth to autonomy and increased malignancy.

Advanced Therapeutics

H.K.B. Silver

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L. Embree, BSc (Pharm.), MSc, PhD
Assistant Professor (Pharmaceutical Sciences)

M.B. Bally, BSc, MSc, PhD
Research Associate (Biochemistry)

This group is a laboratory arm of the Division of Medical Oncology. As such its objectives are to provide laboratory support for clinical research and to develop basic research with direct clinical application. Active areas of investigation include the mechanism of action and clinical application of biological response modifiers, tumour cell resistance and its implications for delivery of chemotherapy, phase I development of chemotherapeutic agents, development of new techniques of clinical monitoring and investigation of basic mechanisms of tumour cell growth and metastasis.

BIOLOGICALS PROGRAM

Recent efforts in the biologicals program have focused on improved delivery with decreased toxicity of interleukin-2 (IL-2). Drs. Silver and Klasa have found that relatively small doses can be delivered directly to the spleen with reduced systemic toxicity and equivalent or improved biological effect. This manoeuvre allows the IL-2 to come in direct contact with the large number of splenic lymphocytes while minimising systemic exposure. This work has also allowed us to gain new insights into the nature of the IL-2 activated killer cells. In an attempt to further improve the therapeutic index of treatment, IL-2 has been encapsulated in various liposome preparations as delivery vehicles. Preliminary animal studies have shown that some formulations are characterised by preferential distribution to lymph nodes, an important target organ for IL-2. We are most fortunate in having Dr. Marcel Bally join our group. Dr. Bally has been a central participant in the development of liposome technology in Vancouver and will be able to apply his talents to the development of this and many related projects.

DRUG DEVELOPMENT PROGRAM

The chemotherapy drug development program includes several related studies. The first is a continuing effort to examine the basis of resistance to the anti-cancer drug methotrexate. These studies have established that in at least one line of cancer cells grown in tissue culture resistance to methotrexate is mediated primarily by mutations occurring in two forms of the key enzyme, dihydrofolate reductase. This can result in an enzyme almost one hundred thousand times more resistant to methotrexate inhibition.

Additional studies underway include computer modelling of the process of drug resistance that occurs in malignancy. This highly successful program has become an essential consideration for drug delivery studies around the world. Current work is concentrating on developing computer based techniques that will permit optimization of clinical chemotherapy protocols.

More recently, as part of support that was given through the Science Council of British Columbia, Drs. Goldie, Embree, and Gelmon have started phase I studies of novel anti-neoplastic agents. The first drug to be studied in detail is liposomal doxorubicin, a novel formulation which may have significant advantages over more conventional delivery methods.

EXTRACELLULAR MATRIX INTERACTIONS PROGRAM

The major focus of Dr. Dedhar's laboratory is the molecular basis of the interaction of cells with components of the extracellular matrix, which include glycoproteins such as fibronectin, laminin, vitronectin and the collagens. Particular interest is focused on the integrins, a family of cell surface receptors for extracellular matrix glycoproteins. Some current projects include the interaction of integrins and growth and differentiation factors, signal transduction mechanisms involved in integrin function, and the role of integrins in tumour invasion and metastasis. Each of these areas provides a potential pathway for attack against the neoplastic process.

TUMOUR MARKER PROGRAM

Substances in the blood called tumour markers can be important for cancer monitoring and detection. Advances in biotechnology have enabled the development of many new or "improved" tumour marker assays. Some of these are under preclinical investigation in this laboratory. In the past year the group has developed an unbiased mathematical method for comparing the power of different assay methods. Using this technique, important new assays will be identified and made available to doctors throughout the Province. The laboratory also has developed a computerised database allowing the serial monitoring of all patients. This constitutes a unique comprehensive tumour marker service.

Dr. Leanne Embree is evaluating the pharmacokinetic behaviour of new anticancer agents during Phase I and II clinical pharmacology drug trials.

Developmental Radiotherapy

G.B. Goodman

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Y. Takai, MD, PhD,
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T. Inomata, MD, DR Medical Science
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Kochi, Medical School, Japan
Fellow, TRIUMF from Jan. 1991

1. CLINICAL TRIALS WITH PI-MESONS (in collaboration with Dr. E. Vogt, Director of TRIUMF, UBC and Dr. L. Skarsgard, Head of Medical Biophysics, BCCF)

A. Phase III Trial in Adult Grade 3 and 4 Astrocytomas

Open June, 1988
Required patient entry - 82
Accrual - 36 patients (pions 19, photons 17)
(two runs per year, total six runs)
Projected closure - January, 1994
Analysis - no interim analysis of outcome is being undertaken
Toxicity monitoring - no evidence of unacceptable toxicity
Study monitoring - slow accrual, all patients appear eligible and evaluable, no major protocol violations

B. Phase III Trial in Stage C and D Prostate

Open June, 1990
Required patient entry - 208
Accrual - 51 patients (pions 28, photons 23)
(two runs per year, total of two runs)
Projected closure - January, 1994
Analysis - no interim analysis of outcome is being undertaken

Toxicity monitoring - no unacceptable toxicity has been noted

Study monitoring - compliance with protocol requirements is excellent. No major protocol violations have occurred.

These two studies are the only phase III randomized studies in the world that compare pions with photons.

C. Late Effects Study

All patients treated with pions are registered with the RTOG and monitored for late toxicity. A total of 293 patients have now been treated with pi-mesons at TRIUMF.

2. ANIMAL RESEARCH WITH PIONS

Dr. Y. Takai from Tohoku University completed his work (see Annual Report 1989-1990).

Dr. Taisuke Inomata will be undertaking comparative analysis of anti-tumour effects of SPG and photons versus pions using the Lewis lung cancer cell inoculated into C-57BL/female mice. This work complements his previous research and will evaluate the relationship between anti-tumour effect and the quantitative histological changes with emphasis on T-lymphocyte infiltration and macrophages.

3. HYPOXIC CHEMOSENSITIZATION AND TUMOUR BLOOD FLOW IN RECURRENT ADULT GLIOMAS

Dr. D. Rheaume is undertaking phase I dose escalation trials using hydralazine to decrease tumour blood flow in patients with recurrent gliomas. Three patients have been studied at the first dose level without untoward toxicity and two patients have been entered at the second dose level.

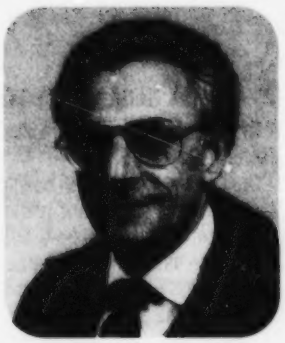
4. ACCELERATED FRACTIONATION IN RADIOTHERAPY (S.M. JACKSON, C.J.H. FRYER, J. LeRICHE, P. OLIVE, L. WEIR)

It is thought that a significant fraction of human tumours proliferate rapidly even during a course of radiation therapy. Accelerated fractionation (standard fraction size given more then once daily) would be of theoretical benefit in such situations.

The primary aim of this project is to identify such cases using laboratory techniques (flow/image cytometry and comet assay) to measure human tumour cell proliferation and ploidy. We will use fine needle aspiration biopsies in patients with breast cancer and squamous cell cancer of the head and neck and evaluate the feasibility of techniques effective in murine systems to measure tumour cell proliferation.

5. PROTON BEAM THERAPY

The proposal for a proton beam facility at TRIUMF is in it's final stage of preparation. This proposal has been endorsed by the B.C.C.A. administration and the Board of Trustees and should be ready in the near future to be submitted to government.



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Epidemiology, Biometry & Occupational Oncology

The Division of Epidemiology, Biometry, and Occupational Oncology conducts major research programs aimed at investigating the causes of cancer and provides a comprehensive research and statistical consulting service for the Cancer Agency.

The Division is divided into four sections; epidemiology, biometry, occupational oncology and environmental carcinogenesis -

The Epidemiology Section conducts etiological studies on breast cancer, melanoma and childhood tumours. As well, collaborative investigations are underway with a number of other centres. A study of risk factors for female genital cancers is focusing on the role of viruses in addition to previous medical history and environmental factors. Data collection will be complete by next year for a study of the relationship between dietary factors and prostate cancer, which the section is conducting jointly with Stanford University, the University of Southern California, the Hawaii Cancer Centre, and the National Cancer Institute of Canada.

A Hospital/Community partnership demonstration project is being conducted in conjunction with the Native Brotherhood of B.C., to implement a cervical cytology screening program in the Native Indian community. Utilization rates of the provincial screening program by Native women have been determined by age and geographic area, and reasons for underutilization have been investigated by interviews of Native women and their health care providers. The second phase, to develop and implement interventions to improve utilization, is currently underway.

Our section is collaborating with the British Columbia Cancer Agency Nursing Division, in a study of pain in cancer patients. The main purpose of the study is to determine the prevalence and characteristics of pain among adult cancer patients at diagnosis, two years after diagnosis, and five years after diagnosis. The study uses a descriptive cross-sectional design and is seeking the participation of over 8,000 patients.

The Biometry Section provides a comprehensive statistical consulting service to basic and clinical researchers. This has involved members of the group in a wide variety of projects in collaboration with researchers from several other disciplines. Individuals within the Section also work on a number of personal research projects which have as their emphasis the application of computers and statistics to oncology. One current project involves the development of computer algorithms to differentiate benign and dysplastic nevi from malignant melanoma using digitized photographs. Another project underway involves the use of computer techniques to simulate tumor growth and progression with a view to optimizing the delivery of chemotherapy.

The Biometry Section has been fortunate to receive some funds from the Capital Campaign which has permitted the purchase of new computer equipment, which will permit analysis of larger and more complex data sets.

The Occupational Oncology Section has undertaken a stepwise program to evaluate cancer risk for specific occupations, and to identify carcinogens in the workplace. After the completion of a feasibility study, an historical cohort study of the pulp and paper industry has now begun. The study will examine mortality and cancer incidence in pulp and paper workers, and when completed will be the largest in the world, surveying over 40,000 workers.

A cohort study of Air Canada pilots is in the data collection phase. This study is being conducted to confirm the findings of an elevated risk of brain cancers, as well as Hodgkin's disease detected in an earlier study of airline pilots. It is expected that results will be available by late 1992.

An innovative chemical coding system for use in current and future studies has been completed, and a biological coding system is currently

being developed. Job-exposure classifications for the mining and pulp and paper industry have also been finished, and the latter will be utilized in the pulp and paper cohort study.

The members of the **Environmental Carcinogenesis Section** have a number of ongoing projects related to the induction and progression of cancer, including a study of carcinogenesis by benzene and its metabolites. New evidence suggests that benzene metabolites cause chromosome damage by interfering with the spindle fibres which separate chromosomes during cell division. A collaborative project with Dr. W. Anwar of Ain Shams University in Egypt, is underway to investigate patients suffering from schistosomiasis, a bladder infection which leads to increased cell proliferation and to bladder cancer. The research will focus on the mechanisms by which cell proliferation can lead to genetic changes, and how this can be prevented by various intervention strategies.

The section has developed a novel system for studying the effects of tumor promoters. Cultured cells containing papilloma virus DNA form transformed colonies. The frequency of cell transformation can be increased by known tumor promoters, and inhibited by known anti-promoters such as retinoic acid. This offers a potential new approach to determine the effectiveness of agents used for cancer prevention. The section continues to examine genetic damage in human populations exposed to environmental carcinogens. In addition, a new project has been initiated which will examine the relationship between various modifiable dietary and lifestyle factors and the recurrence rate of cancer in newly diagnosed breast cancer patients.

Veronica Anthony and Dr. Bruce Dunn examine dietary questionnaire data used to investigate the effect of diet on breast cancer recurrence rates.

Joint Animal Facility

During the last year the Joint Animal Facility has, due to the ever increasing sophistication in research technology, witnessed an expansion of its program and protocols to include a functional rodent sterile breeding facility. This expansion has resulted in an increased demand for improved rodent cages and equipment. The acquisition of one additional Laminar-Flow work bench unit and over 380 complete microisolator units has been financed with user-generated funds.

The above has resulted in a heavy demand for labor intensive animal care husbundry and monitoring activities. The guidelines of the Canadian Council on Animal Care are closely followed. Acknowledgement of Mr. Fred Jensen's (Senior Technician) every day activities is noted. He has been well assisted by Mr. Darrell Trendall.

The Joint Animal Facility Management Committee reports through its Chairman to the Research Management Committee of the British Columbia Cancer Research Centre. The membership of the Joint Animal Facility Management Committee has recently been expanded to include: Drs. C. Eaves, A. Eisen, P.W. Gout, J. Love, P. Olive, F.A. Salinas, J. Vielkind, Rev. C. Johnston, and Mr. J. Coombs (ex-officio).

F.A. Salinas, DVM
Chairman
August 1991

Master Publications List 1990-91

British Columbia Cancer Agency and British Columbia Cancer Research Centre

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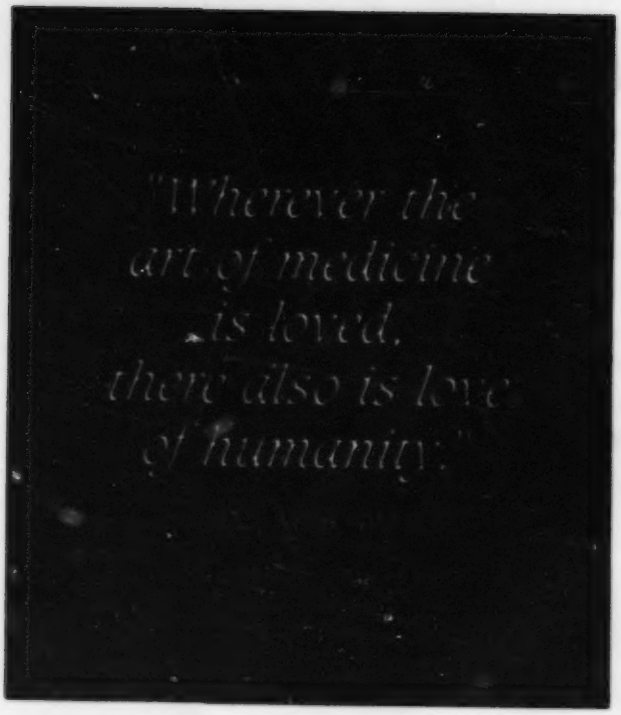

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Dr. G.R.F. Elliott

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Dr. S.M. Jackson

Dr. R.E. Robins

President's Report

Fred B. Moore

1990/91 marks an historical year for the British Columbia Cancer Foundation - historical in terms of establishing a financial relationship with the Canadian Cancer Society, B.C. & Yukon Division, and an operating-administrative relationship with the British Columbia Cancer Agency. The financial arrangement is detailed comprehensively in a legally enforceable contract called "the Tripartite Agreement", the three parties being the British Columbia Cancer Foundation, the British Columbia Cancer Agency and the Canadian Cancer Society, B.C. & Yukon Division. The operating-administrative arrangement is covered in detail in an "Administrative Agreement" between the British Columbia Cancer Foundation and the British Columbia Cancer Agency. An enormous effort of year-long study and negotiation - a great deal of this with guidance provided by some dedicated volunteers as well as professional consulting firms - has been required to finalize these matters.

Briefly, the "Tripartite Agreement" recognizes the Canadian Cancer Society henceforth as the single cancer fundraising organization in British Columbia. This is intended to overcome the everlasting public confusion as to which of three cancer organizations should be favoured at fundraising time. (To be sure, designated donations still can be directed via the Canadian Cancer Society.) Another very important part of the "Tripartitie Agreement" requires the Canadian Cancer Society, B.C. & Yukon Division, to guarantee a base budget for the operation of the B.C. Cancer Research Centre, this in exchange for the B.C. Cancer Foundation relinquishing its historic role as a fund raiser. One may ponder as to possible future points of disagreement that might arise between three participating parties in an arrangement like this. Anticipating such a possibility, the agreement stipulates that an "Inter-Agency Committee" be appointed to arbitrate any such problems, and of course the British Columbia Cancer Foundation will be represented on this panel.

The "Administrative Agreement" with the British Columbia Cancer Agency has been developed to effect measures of economy. All British Columbia Cancer Foundation administrative activities will now be handled by the British Columbia Cancer Agency staff. This agreement also calls for inter-locking representation between the Boards of Directors of the two groups to ensure that British Columbia Cancer Foundation property and policy matters are properly monitored and maintained. A further very significant proviso stipulates that the British Columbia Cancer Agency undertakes to cover any shortfall in the foregoing described base budget flowing to the British Columbia Cancer Foundation from the Canadian Cancer Society, B.C. & Yukon Division. Now, with its annual budget guaranteed, the British Columbia Cancer Research Centre should move forward with a greater measure of fiscal stability.

Along with these efforts to ensure sound fiscal policies, the British Columbia Cancer Foundation's pursuit of government funding continues. This is needed, in addition to basic financing, to improve plant facilities, research programs and service to the public's ever-increasing need for world class cancer care.

A personal approach to the Ministry of Health by one of our Board members resulted in follow-up visits and facility inspections by Ministry representatives. What this will mean in financial terms remains to be seen, but we obviously have attracted the attention of the Ministry of Health.

A "Royal Commission on Health Care and Costs" convened in Vancouver for a few days during the winter. This afforded yet another opportunity to stress our position, our needs and our responsibilities to the public. While such an occasion can sometimes appear to be a formality, nevertheless we were recognized, our case was made and questions were asked of us.

In April, we had some rather notable guests. The "Management Society of Healthcare Professionals" from Hong Kong visited us for a tour of the British Columbia Cancer Research Centre and the British Columbia Cancer Agency. Comprised of physicians, nurses, pharmacists, administrators and para-medics, the group came here to study various health care delivery organizations.

At this point, grateful mention must be voiced for the scientific staff. We often and proudly speak of their stellar capabilities. Having said that, justification for the claim is found in the recognition and support which they received from such organizations as the National Cancer Institutes of both Canada and the United States, the U.S. National Institute of Health, the Medical Research Council of Canada, the Vancouver Foundation, the P.A. Woodward Foundation and the University of British Columbia. We also thank the Canadian Cancer Society, B.C. & Yukon Division, for their continued support of the B.C. Cancer Studentship Program.

We are indebted to several women's organizations: The Women's Auxiliary of the British Columbia Cancer Agency, the Order of the Eastern Star, the Imperial Order Daughters of the Empire, and the Women's Auxiliary of the Fraternal Order of Eagles. These women not only raise considerable sums of money for the cancer cause, they also perform wonderful support work in both facilities, the British Columbia Cancer Foundation and the British Columbia Cancer Agency.

I am most appreciative of the British Columbia Cancer Foundation's Board members' participation throughout the year. Their interest and expertise have been of great help. Our Executive Director, David Catton, has laboured long and effectively, as has his Executive Secretary, Brenda Prieur. My thanks to them for their talents so willingly used on behalf of the British Columbia Cancer Foundation.

It certainly appears that the British Columbia Cancer Foundation, with its new fiscal and management relationships, will enter upon a new era of service in the health care community. It is an ongoing challenge which we willingly accept.

Fred B. Moore
President

Women's Auxiliary

Kathleen Conway

This is my last year as President.

Although we are not a fund raising organization, we are grateful for the financial support given us by the B.C. Cancer Society. We are a very concerned group of volunteers who continue to direct our services to the care and comfort of the physical and social needs of patients in the clinic.

Our various chairmen reports will give you an insight as to how we serve in the many different areas. We also serve in the Social Work Department wherever we can assist in caring for the patients. We have extended our services to the Canadian Cancer Society during the fund raising program.

Our Auxiliary enjoys a good rapport with the other volunteer groups, the Order of the Eastern Star, the IODE and Trefoil Groups.

We would also like to thank Mrs. Louise Schultz, head of the volunteers at the Lodge, for her help in our Christmas program.

On behalf of the Auxiliary, I would like to thank Mrs. Leslie Bradley and her staff for the help and support given us during the year. Many hours were put into updating our manual for which we do thank Lorraine Butler.

This is my final year of serving on the Board of the Foundation and the Cancer Society, and to attend as an observer the meetings of the Board of Trustees of the B.C. Cancer Agency. It was with great interest that I listened and learned of the goals and achievements of these organizations. I also attended the Cancer Society Annual Meeting held at the Delta Hotel and annual Agency Board of Trustees retreat at the Dunsmuir Lodge in Sidney - this was a privilege I will never forget.

We want to thank the Seniors Lottery Society for the grant of $5,000 given to the new chemotherapy area on the sixth floor.

May I thank Auxiliary members for their commitment and dedication to our goals. I cannot express how much I appreciated the wonderful executive and committee chairmen who gave such faithful cooperation and support during my two years of service.

Respectfully submitted,

Kathleen Conway
President

Property & Building Committee

Philip A. Heaps

A number of major projects and maintenance programs have been before the Property and Building Committee during the past year but few matters have been brought to a satisfactory conclusion. The continuing lack of adequate financing for special maintenance and for alterations and renovations within the aging BCCCRC Building have proved both frustrating and discouraging although a few projects did progress through the planning stage. During most deliberations, it has been necessary to consider the fact that the present building has a limited life expectancy and that the expenditure of funds on the existing structure should be limited to immediate and urgent needs. However, this approach must now be backed up by a positive and enthusiastic program leading to the replacement of the present structure if Cancer Research in British Columbia is to continue at an acceptable level. Such planning and related fund-raising will take several years and an immediate start is essential.

The project requiring the greatest amount of time and money during the year, involved replacement of the Research Centre's roof. When it became apparent that structural and insulation damage was resulting from many water leaks, and on the advice of a consultant, the decision was made to carry out the replacement along with the necessary substructure repairs. The contract for this work came to $200,000 plus some structural repairs which have yet to be compiled. I wish to extend special thanks to the Provincial Government's "Go B.C." program which contributed the sum of $60,000 of Lottery funds towards these roof renovations.

During the year, efforts were made to accommodate the changing space needs of the Cancer Imaging section for it's developing program in conjunction with the Microscan Corporation. While the major expansion into the far west section of the main floor of the Centre had to be abandoned for the time being because of the high costs involved and difficult timing, flexible use of other space was arranged at minimal cost so that the section could continue to function.

A major project is proposed for an Oncogene Diagnostic Lab in the Cancer Endocrinology Division, which would involve the use of an undeveloped area of the lower main floor. The plans were drafted and costing completed for this laboratory showing that financing in the amount of approximately $300,000 would be required. As all the necessary funds are not yet available, the project is being held in abeyance.

With the conclusion of the initial screening mammography project, it was possible to make this space available to the Epidemiology section with only minor alterations to the building and at a minimum cost of approximately $24,000. The necessary design work having been completed, these modifications should be underway in the near future.

A proposal was received by this Committee for the development of a portion of the Terry Fox Laboratory, presently used as a student area, into full Laboratory facilities. Funds have been released from the Capital Fund Campaign for the planning phase of this project and, once architectural drawings are approved, the necessary engineering and quantity surveys can be carried out. Other minor space reassignment is planned in conjunction with this development.

Many individuals have made continuing and valuable contributions to the functions of the Property and Building Committee - some for quite a number of years. Since 1982, I have had the privilege of Chairing this Committee and during that time have had the pleasure and challenge of working with these dedicated people who have given freely of their time and expertise in supporting the operation and development of the Research Centre. I am very grateful to all of them and would mention specifically the present members, - Mrs. Anna Linsley, Dr. Hugh McDonald and Mr. Fred Moore from the Executive Committee of the Board of Directors, and special appointees, - Dr. Hulbert Silver from the Research Management Committee, Mr. Dave Richardson and Mr. Stan Young of the BCCA, Mr. Einar Labo, our Consulting Architect, and Mr. David Catton, the Foundation Executive Director and our Secretary, Brenda Prieur. The Committee have received tremendous support, guidance and direction from David Catton who has given sound advice and kept us well informed. There will be extremely interesting and very challenging times ahead for the BCCRC. The governing bodies of the BCCF, the BCCA, and the B.C. Yukon Division of the CCS will be charged jointly with meeting those challenges.

Philip A. Heaps
Chairman

Annual Report Finance Committee

Anna H. Linsley

Several fundamental changes took place this year in the financial position of the B.C. Cancer Foundation.

Very successful fundraising efforts at the end of 1990, coupled with severe budgetary restraints, left the Foundation in a reasonable financial position at the time of the signing of the Tripartite Agreement. This agreement between the B.C. Cancer Foundation, the B.C. Cancer Agency and the Canadian Cancer Society, B.C. and Yukon Division, whereby fundraising for all three parties is carried out by the Cancer Society, provided the Foundation with a specific operation grant per month, retroactive to October 1, 1990. All funds raised in that period were handed over to the Society upon the signing of the Tripartite Agreement and the Foundation received operating grants from the Society in the amount of $797,229 to March 31. Included in the agreement is a funding formula for the re-roofing expenses, with the total amount, up to $200,000, covered by equal loans from the Agency and BCCF's share of future incremental funds from the Society. A GO-BC grant of $60,000 reduced the size of these loans, and with roof repairs thus financed, the Foundation can present balanced financial statements to March 31, 1991.

The Foundation's invested assets showed at $1,064,701, which is exclusive of designated purpose funds and investigative grants. The preservation of these funds will be essential to maintaining the Foundation and its assets.

In order to improve the effectiveness of the operations of the Research Centre, cut down on operating costs for the Foundation and take advantage of a better GST rebate from the government, the Foundation is expected to sign an agreement with the B.C. Cancer Agency whereby the Agency will run the Research Centre for the Foundation. With the operating grant from the Tripartite Agreement and the Foundation's continued commitment to a balanced budget, the Agency will be responsible for all Foundation budgetary overruns. The duration of this agreement will be linked to the duration of the Tripartite Agreement.

A tremendous effort by staff and volunteers has produced these results, and on behalf of the Finance Committee, Mr. F. Moore, Mr. I.M. Adam, Mr. V.F. MacLean, I thank the staff of the Foundation, Ms. B. Prieur and Mr. David Catton and the Agency staff, Dr. D.J. Klaassen, Mr. B.T. Schmidt, Mr. D. Morrison and Ms. S. Kennedy, for their untiring efforts to secure the financial position of the B.C. Cancer Foundation and the B.C. Cancer Research Centre.

Anna H. Linsley
Chairman, Finance Committee

Bursary, Scholarship & Awards Committee

Christina Mazzone

The Bursary, Scholarship & Awards Committee met in March to review a total of 34 studentship applications for the May - August term. As in the past awards were granted on the basis of each student's qualifications as well as the quality and relevance of the proposed project in the field of oncology.

The Committee defined eligibility criteria for the awards by stating that award recipients must be residents of British Columbia and their summer projects must take place in B.C. This will allow students who are enrolled in universities outside the province to be eligible for the awards, providing they return to B.C. for the duration of their summer project.

The total award for 1991 was increased to $4,400 per student, an increase of 10% over previous years. This increase reflects the higher cost of living and is competitive with other award programs in the Lower Mainland.

I am pleased to report that a total of twelve studentship awards were granted, including the J.M. Warren and A. Maxwell Evans Awards. We also received a grant from the Challenge '91 Programs which was used to partially fund three of those studentships.

Every year, the A. Maxwell Evans and the J.M. Warren Awards are granted to two outstanding students. This year, Mr. Mark McLaughlin was awarded the A. Maxwell Evans Award, on the advice of the Faculty of Medicine, University of British Columbia. Mr. McLaughlin is working with Dr. Donna Hogge of the Terry Fox Laboratory on a project dealing with "Autocrine Production of Growth Factors".

The J.M. Warren award was granted, for the second year in a row, to Mr. Torsten Nielsen, the highest ranking studentship applicant. Mr. Nielsen is working with Dr. Nellie Auersperg of the Department of Anatomy, University of British Columbia, on a project entitled "Effect of Lovastatin on p21-ras Mediated Characteristics of Cultured Cells".

The other Studentship recipients for 1991 are: Michael Butchart, Heather Jenkins, Sayrin Lalji, Heidi Lam, Rolfe Luongo, Dana Miskulin, Bronwen Morrison, Tracy Sexton, Terrance Wong, and Betty Yip.

All students have been working under the supervision of senior scientists who are affiliated with the B.C. Cancer Research Centre and the University of British Columbia.

We are grateful once again to the Canadian Cancer Society for providing the major funding for the B.C. Cancer Studentships. We appreciate the Society's continuing support and generous contribution to this very important program. Funding for both the A. Maxwell Evans Award and the J.M. Warren Award is provided annually by the B.C. Cancer Foundation from the proceeds of an Endowment Fund established in 1984.

During 1990-91, the British Columbia Cancer Foundation approved 20 travel grants to graduate students and post-doctoral fellows. These grants were established to help defray travel costs when students are invited to attend conferences to present their work in the field of cancer research.

Both the studentship program and the travel grants are important to the British Columbia Cancer Research Centre. These prestigious awards enable us to recognize academic excellence and to encourage promising young people to continue to pursue a career in oncology.

I would like to thank the members of the Committee for their guidance and assistance in making this educational program a success: Dr. N. Auersperg, Dr. D. Mager, Dr. B. Palcic, Mrs. A. Rubingh, Dr. P. Rennie, Dr. K. Skov, Mr. F.B. Moore, and Mr. D. Catton.

Christina Mazzone
Chairman

Mark McLaughlin

Mark McLaughlin, the 1991 A. Maxwell Evans award recipient, is a second year medical student at U.B.C. As an undergraduate at the University of Victoria, he studied chemistry and biochemistry and was enrolled in the chemistry co-op programme. In 1989, as a co-op student, he worked at the Terry Fox Laboratory under the direction of Dr. Keith Humphries. Mark has maintained an interest in cancer research and is working this summer with Dr. Donna Hogge constructing recombinant retroviral vectors containing hemopoietic growth factor genes.

Torsten Nielsen

1991 marked Torsten's third summer working under the auspices of the BCCF studentship program, and his second with the J.M. Warren Award. He would like to thank everyone involved for the marvellous support and excellent training. Having just graduated from UBC with a biochemistry honours degree, Torsten is now off to Montreal to pursue a joint M.D./Ph.D. program at the McGill Cancer Centre. He hopes to make it back to B.C. someday!

Auditors' Report

To the Board of Directors,
British Columbia
Cancer Foundation

We have audited the balance sheets of the general and designated funds and the British Columbia Cancer Research Centre fund of the British Columbia Cancer Foundation as at March 31, 1991 and the statement of changes in the general and designated fund balances for the year then ended. These financial statements are the responsibility of the Foundation's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with generally accepted auditing standards. Those standards require that we plan and perform an audit to obtain reasonable assurance whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation.

In our opinion these financial statements present fairly the financial position of the Foundation as at March 31, 1991 and the results of its operations and the changes in its financial position for the year then ended in accordance with generally accepted accounting principles described in Note 2. As required by the British Columbia Society Act, we report that, in our opinion, these principles have been applied on a basis consistent with that of the preceding year.

Price Waterhouse
Chartered Accountants

Financial Statements

Balance Sheet
General & Designated Funds

	March 31 1991	1990
Assets		
Current assets		
Cash and short-term investments (Note 4)	$5,141,000	$3,806,869
Amounts receivable		
Canadian Cancer Society (B.C. and Yukon Division)	219,064	-
Other	347,253	263,380
Prepaid expenses	16,992	55,029
Inventory	32,405	32,405
	5,756,714	4,157,683
Other marketable investments (market value - 1991 - $1,622,854; 1990 - $1,507,164)	1,507,164	1,507,164
Endowment fund (Note 5)	734,000	734,000
	$7,997,878	$6,398,847
Liabilities and Fund Balances		
Current liabilities		
Due to British Columbia Cancer Agency	$365,320	$313,147
Accounts payable and accrued liabilities	81,183	67,156
Deferred revenue	-	48,333
	446,503	428,636
Fund balances		
General	618,199	674,999
Designated	6,933,176	5,295,212
	7,551,375	5,970,211
	$7,997,878	$6,398,847

Approved on behalf of the Board

Director Director

Balance Sheet
British Columbia Cancer Research Centre Fund

	March 31 1991	1990
Assets		
Land, buildings and improvements, at cost (Note 9)	$4,297,438	$4,190,552
Fund balance		
Fund balance	$4,297,438	$4,190,552

Statement of Changes in General & Designated Fund Balances

	Year ended March 31, 1991			Year ended March 31, 1990		
	General Fund	Designated Fund	Total	General Fund	Designated Fund	Total
Fund balances at beginning of year	$674,999	$5,295,212	$5,970,211	$1,022,840	$4,606,717	$5,629,557
Additions						
Revenue						
Bequests	296,754	260,865	557,619	533,211	320,502	853,713
Donations	131,551	1,477,211	1,608,762	365,955	938,621	1,304,576
Investment income	270,754	594,696	865,450	287,069	510,087	797,156
Fees from services	-	631,592	631,592	-	559,415	559,415
Canadian Cancer Society (B.C. and Yukon Division)	847,629	-	847,629	50,000	-	50,000
Fund Raising Projects - net of direct expenses	217,706	-	217,706	216,153	-	216,153
Other	43,884	299,667	343,551	68,655	144,317	212,972
	1,808,278	3,264,031	5,072,309	1,521,043	2,472,942	3,993,985
Deductions						
Research expense						
Core Support Units						
Cancer Imaging Unit	227,029	-	227,029	200,446	-	200,446
Environmental Carcinogenesis Unit	222,731	-	222,731	192,605	-	192,605
Medical Biophysics Unit	503,962	-	503,962	466,442	10,379	476,821
B.C. Cancer Research Centre - net of recoveries	592,010	-	592,010	518,692	-	518,692
Laboratory and other services	-	609,802	609,802	-	477,240	477,240
British Columbia Cancer Agency	8,099	792,787	800,886	7,892	1,084,690	1,092,582
Designated projects	-	223,478	223,478	-	212,138	212,138
Unallocated administration (Note 6)	241,647	-	241,647	198,917	-	198,917
Write-down of investments	-	-	-	214,992	-	214,992
Other	69,600	-	69,600	68,898	-	68,898
	1,865,078	1,626,067	3,491,145	1,868,884	1,784,447	3,653,331
Change in fund balances	(56,800)	1,637,964	1,581,164	(347,841)	688,495	340,654
Fund balances at end of year	$618,199	$6,933,176	$7,551,375	$674,999	$5,295,212	$5,970,211

Notes to Financial Statements
March 31, 1991

1. Nature of operations

The British Columbia Cancer Foundation (the Foundation) owns and operates the British Columbia Cancer Research Centre facility (the Research Centre).

The Foundation allocates its revenues and expenditures as follows:

Operating funds

General Fund

This fund receives all revenues which are not specified or designated at source as to their use. The Executive of the Foundation from time-to-time commits certain of these revenues to specific projects of the British Columbia Cancer Research Centre Fund and the British Columbia Cancer Agency (the Agency).

Designated Fund

This fund includes bequests and donations (and related investment income) which are designated for a specific use by the donor and other income specified by the Foundation.

British Columbia Cancer Research Centre Fund

This fund represents the cost of the Foundation's investment in the land, buildings and improvements of the Research Centre.

2. Accounting policies

The Foundation's accounting policies follow generally accepted accounting principles except that income from bequests is recorded when received.

Land, buildings, and improvements held for research purposes are capitalized in the British Columbia Cancer Research Centre Fund at cost and no depreciation is charged.

3. Tri-partite agreement

During 1990, and with effect from October 1, 1990, an agreement was entered into with the Canadian Cancer Society (B.C. and Yukon Division) (the Division) and the Agency. Under this agreement, the Division assumed responsibility for the fund-raising activities of the Foundation and the Agency, including the administration of all bequests and charitable donations. In return, the Division has agreed to provide the Foundation with a grant for the operation of the Research Centre. The initial term of this agreement is five years with options for renewal.

A second agreement was entered into with the Agency. Under this agreement, which has not been formally ratified, the Agency assumed responsibility for the administration of the Research Centre, with effect from April 1, 1991. This agreement expires upon termination of the agreement between the Division, the Agency and the Foundation.

4. Cash

The Foundation has invested $2,536,744 (1990 - $1,586,000) in an interest bearing account administered by the Agency.

5. Endowment fund

This Fund is administered by the Vancouver Foundation with the Foundation receiving the income generated therefrom after deduction of administrative costs. Under the terms of the agreement, the Foundation is entitled to withdraw all its contributions with the exception of $10,000 initially contributed which was expensed in 1981. The capital in the Fund amounted to $1,159,000 at March 31, 1991 (1990 - $1,159,000) of which $744,000 was contributed by the Foundation and $415,000 by the Vancouver Foundation.

6. Unallocated administration expenses

	1991	1990
Salaries	$52,802	$48,865
Office and general	49,813	46,299
Legal and audit fees	47,237	18,548
Fund-raising and development	91,795	85,205
	$241,647	$198,917

7. Investigative grants fund

The Foundation acts as custodian for investigative grants awarded from various private and public agencies for specific research projects. Amounts administered by the Foundation are as follows:

	1991	1990
Excess advances (amounts receivable), beginning of year	$98,821	$(82,516)
Add: Advances received on grant awards	1,608,470	1,645,431
	1,707,291	1,562,915
Less: Expenditures	1,630,025	1,464,094
Excess advances, end of year	$77,266	$98,821

Excess advances are not included in cash and short-term investments.

8. Statement of changes in financial position

A statement of changes in financial position has not been presented as it is not considered meaningful in the circumstances.

9. Commitment

Prior to March 31, 1991 the Foundation approved a major renovation project at a total estimated cost of $225,000, $106,886 of which is included in land, buildings and improvements of the British Columbia Research Centre Fund at March 31, 1991. The interim funding for this project has been committed to by the Agency and the Division. As part of the fund-raising agreement referred to in Note 3, the Foundation has agreed to assign part of its share of the proceeds of any future joint incremental fund-raising activities to cover this interim funding (including interest at prime less 1%). The funding parties have no other recourse for repayment.

Donations & Bequests

received during the period April 1, 1990 to March 31, 1991

With the signing of the Tri-partite Agreement between the B.C. Cancer Agency, the B.C. Cancer Foundation and the B.C. and Yukon Division of the Canadian Cancer Society, the Society became the official fund raiser for the cancer cause in B.C. As such, the B.C. and Yukon Division of the Society will now be issuing all receipts for Income Tax purposes and this will be the last issue of the B.C. Cancer Foundation Annual Report which will record donations. The following listing of donations, gifts and bequests to the B.C. Cancer Foundation covers the period from April 1st, 1990 to March 31st, 1991.

However, because the Tri-partite Agreement came into effect on March 1st, 1991, certain donations received in the month of March will have been receipted in that month by the Canadian Cancer Society and will not be recorded in this list. Furthermore, because the Agreement was given retroactive effect to October 1, 1990, those donations receipted by the Foundation subsequent to that date were transferred, in total, to the Division.

We take this opportunity to thank the many Friends of the Foundation and regular donors who, across the years, have supported the work of the Foundation and the B.C. Cancer Research Centre.

Achiam, Ms. Leolinda	100
Achtem, Mrs. Anne	100
Adair, Ms. Josephine L.	500
Adam, Ian M.	2,000
Adams, Miss. Doris	500
Adamson, Mr. & Mrs. D. C.	100
Agabob, Ms. Nora	400
Ainsworth, Ms. I.B.	100
Aarigg, Mr. Cecil	1,073
Alcock, Ms. Laura S.	100
Algard, Ms. Annette E.	100
Allen, Mr. Raymond	1,500
Allen, Mr. Richard	500
Alston, Mrs. E.	5,000
Anderson, Dr. George	1,000
Anderson, Ms. Constance C.	100
Angus, Mrs. Ann C.	100
Annand, Mr. & Mrs. Bruce	1,000
Archer, Mr. M. Rue	100
Armstrong, Mr. Stanford B.	100
Arnold, Mr. & Mrs. Rose	100
Atkins, Ms. Gail R.	100
Aune, Mrs. Nina	100
Baillie, Ms. Kathy	127
Baker, Mr. Percy C.	100
Baker, J. Richard	1,000
Ball, Dr. John H.	100
Ballard, Mr. Peter	200
Barana, Mr. C.	100
Barclay, Ms. Ann Victoria	100
Barnes, Mrs. Bianca	100
Barr, Mr. & Mrs. L. M.	300
Bates, Mr. C. P.	100
Beard, Mr. B.	100
Beer, Dr. C. T.	500
Bentley, Ms. A.	250
Bentley, Mr. Peter J. G.	5,000
Berg, Mr. & Mrs. Alex	200
Bie, Mrs. Jean P.	100
Billan, Ms. Kashmir	1,600
Black, Ms. Catherine L.	100
Black, Mr. W. David	1,000
Bloch, Mr. & Mrs. Ted	100
Block, Mr. & Mrs. Jack	100
Blom, Ms. Jan	1,100
Bolton, Ms. Carol	100
Bone, Mr. L. A.	100
Bonnell, Dr. R.R.	100
Boon Pin, Mr. & Mrs. Yoon	100
Bourne, Mr. Fred	115
Boyce, W. V.	300
Boyce, M. J.	100
Boyes, Dr. D.A.	150
Bradley, Ms. M.	100
Bray, Edyth	100
Brazier, Mr. Charles W.	600
Brenner, Mrs. Robin	100
Brereton, Mr. & Mrs. J. E.	100
Bromley, Mrs. Marion	100
Brooks-Hill, Ms. Priscilla H.	100
Brown, Mr. & Mrs. Quentin	200
Brown, Mr. Randall	100
Brown, Mrs. Wilma	1,000
Brown, Mr. W. Thomas	5,000
Brown, Mrs. Dorothy	200
Brown, Mrs. R. A.	1,000
Brown, Mr. Peter M.	500
Bruk, Mr. John	2,000
Budd, Mr. & Mrs. John	200
Bukowski, Mr. Erwin	100
Bull, Mr. John K.	500
Burroughs, Mr. & Mrs. K. H.	100
Burton, Miss Marjorie	500
Cairns, Dr. Eva M.	100
Cairns, Dr. A.	300
Caldwell Family,	100
Cameron, Ms. Olga	100
Cantelon, Mr. J. D.	1,000
Cantwell, Mrs. W.	100
Caroti, Mr. Sergio	100
Carlile, Mrs. Phyllis	100
Carroll, Dr. K. K.	100
Carter, Mr. M. E.	5,000
Caswell, Mr. Ira H.	100
Celle, Mr. P. D.	280
Chan, Mr. & Mrs. Gordon	500
Chan, Mr. & Mrs. Albert	100
Chan, Mr. & Mrs. Michael	100
Chan, Mr. S.L.	200
Chan, Mr. Gordon	2,462
Chan, Mr. Hin Tat	100
Chan, Dr. Alfred	100
Chan, Dr. Anthony C. W.	100
Chan, Mr. Henry	250
Chan, Mr. & Mrs. Chiu Yin	100
Chi-Man, Mr. & Mrs. Lau	500
Chibanoff, Ms. Janet	100
Ching, Dr. & Mrs. Lionel	100
Chiu, Mrs. S.C.	200
Chiu, Mr. & Mrs. Wallace	100
Choice, Mr. Ray	450
Chomack, Mr. M. W.	400
Choong Sai, Mr. & Mrs. Low	100
Chow, Ms. Annie	100
Chow Ng, Mr. Ka	250
Chua, Dr. L.K.	300
Chung, Mr. Peter	1,000
Chung, H.	1,000
Chung Fat, Mrs. Richard	100
Ciccozzi, Mrs. Phylleda	400
Clarke, Mrs. Doreen E.J.	1,500
Clarke, Mr. James A.	250
Cliff, Mr. Andelle F.	200
Cliff, Ms. Nancy	500
Cliff, Leslie G.	1,000
Cliff, Ronald Laird	1,875
Clover, Mrs. Patricia	100
Clyne, Mr. & Mrs. J. Stuart	180
Cobb, Mr. & Mrs. W. J.	100
Cockriell, Mrs.	500
Coffman, Mr. & Mrs. Norvall	1,000
Coggin, Mrs. Mary	2,200
Colborne, Mr. & Mrs. Rick	2,646
Colborne, Ms. Isabelle	2,558
Coles, Mr. John A.	300
Coles, Mrs. Anna M.	100
Collier, Pat	123
Conner, Mr. Ralph	100
Cooke, Ms. H.W.	100
Cosman, Ms. Leslie	100
Coughtry, Mrs. L. M.	100
Coulter, Mr. John F.	100
Craven, Mr. Syd	100
Crooks, Mrs. Maureen C.	125
Cummings, Mr. & Mrs. Gordon/Harriet	200
Cundiff, Mr. M.	187
Currie, Mr. Thomas	100
Cusson, Jean M.	200
D'Eath, Mr. & Mrs. John	250
Dafoe, Mrs. E. J.	200
Dafoe, Mr. Richard R.	100
Dagg, Mr. Raymond G.	150
Dal Santo, Mr. & Mrs. G.	100
Davidson, Mr. A.E.	100
Dawes, Mrs. Maureen	100
Dawson, Mr. G. R.	500
DeVitt, Jane & Stuart	100
Deacon, Mr. & Mrs. Cal	100
Debous, Mr. & Mrs. A. D.	100
Decew, Mr. W. Howard	128
Dejong, Ms. Sheila	100
Denhaan, Mr. B.	100
Dennison, Mrs. Lorna	136
Dewale, Mr. R.H.	100
Dickinson, Ms. Eileen A.	100
Dill, Mrs. Olive	150
Dobell, Mrs. C.	100
Donaldson, Mr. Richard	100
Dooling, Mr. P.J.	400
Doran, Mrs. Jean	100

Dossett, Mrs. Constance E.	2,000
Down, Mr. Albert	222
Downie, Ms. Mary	100
Doyle, Ms. Angela	100
Draper, Mr. & Mrs. R. G.	300
Drinkwater, Mr. Alan	200
Driscoll, Mrs. Jeanne	114
Duerksen, Mrs Diana R.	100
Duncan, Mrs. Gillian E.	200
Dunlop, Lynne	100
Dunn, Mr. Gary W.	100
Dutton, Mrs. Gracia	100
Eaves, Mr. & Mrs. Charles	200
Eckman, Ms. Barbara	100
Edwards, Mrs. Frances	100
Edwards, Harley G.	500
Ellaway, Philippa M. & G. Robert	200
Elliot, Mr. Ivor	250
Ellis, Mr. A. John	2,000
Embra, Mr. & Mrs. Maurice	100
Erb, Mr. James	4,200
Erskine, Mrs. Audrey M.	4,000
Evans, Dr. Adele M.	1,000
Evans, Mr. Richard J.	100
Everest, Miss K.	100
Everitt, Mr. John	100
Eyber, Ms. Elvira M.	500
Faiola, Maria G.	500
Falconer, D. W.	150
Fawcett, Mr. John Noble	250
Fehr, Mr. Abe	300
Fiddler, Mr.& Mrs. Larry	100
Field, Ms. Hilda B.	100
Finlayson, Mr. Charles D.	200
Finstad, Ms. L.	500
Fisher, Ms. Grace M.	100
Fladmark, Mr. Knut	200
Fletcher, Mrs. Judith Anne	100
Flynn, Mr. Alan	100
Fong, Mrs. Eva Y. W.	100
Ford, Mr & Mrs. R.	100
Ford, Mr. Len	200
Forster, Mr. & Mrs. Charles	100
Forsyth, Mrs. V.	250
Foster, Mr. Edward H.	100
Francis, Mr. M.	134
Fransblow, Dr. Peter	100
Freybe, Mr.& Mrs. Ulrich C.H.	500
Friesen, Mr.& Mrs. Peter	100
Froembling, Mr. Otto	200
Fromson, Mr.& Mrs. Bill	100
Furness, Ms. H.S.	300
Gallagher, Mr.& Mrs. P.	100
Gallagher, Mrs. Muriel	100
Galt, Mr. David	100
Garacia, Mr. & Mrs. Ferrando J.	100
Garcia, Mr. Jose	100
Gardiner, Mr. W.D.H.	200
Gardom, Ms. Helen E.	100
Garm, Mrs. P.	120
Garner, Dr. David	100
Garrett, Ms. Margaret	100
Gaube, Mrs. H.	100
Gee, Mr.& Mrs. Mon Yow	100
Geoghegan, Ms. Barbara	500
Gibson, Mr. T.	200
Gibson, Mrs. Constance C.	400
Giesbrecht, Ms. Ellen	200
Giles, Mr. Stanley P.	100
Gillespie, Ms. Pearl E.	500
Gillies, Mr. Donald	100
Glover, Mr. & Mrs. Mark	100
Godley, Mr. Martin J.	100
Goold, Ms. Nancy	100
Gourlay, Ms. Nora D.	100
Graham, Mr. & Mrs. P. L.	100
Grant, Ms. Doris M.	100
Gray, Mrs. Lorna	150
Greaves, Mr.& Mrs. J.R.	100
Greenlaw, Ms. Barbara A.	1,000
Grey, Ms. Ebba	100
Grice, Mr. & Mrs. W. D.	100
Griffith, James	100
Groves, Ms. Patricia	100
Groves, Ms. Myrtle M.	100
Gunn, Mr. Barry J.	200
Guthrie, Ms. M.	100
Gwilliam, Mrs. Cassanda	100
Hager, Mr. Phil	100
Hagnes, Mr. Ed	100
Hallett, Mr. W. B.	100
Hallman, Mr. Ian	125
Hamilton, Mr. William T.	100
Hammill, Mr. Robert K.	100
Hampsen, Ms. Rosemary	1,800
Hannemann, Walter F.	250
Hansen, Mr.& Mrs. Harris	100
Hansen, B.G. & J.L.	100
Harold, Mr. John	100
Harris, Mr. J.	100
Harris, Dr. Gordon	100
Harris, Mrs. G. K.	1,000
Hassell, Ms. Patricia R.	335
Hawkesworth, Mr. R.J.	100
Heaney, Mr.& Mrs. J.	100
Heaney, Mrs. Helen	200
Heaney, Helen & Jime	100
Heard, Mrs. Elena M.	100
Heatherington, Ms. A.	300
Helgason, Mr.& Mrs. W.R.	200
Hendel, Mr. A. M.	200
Henderson, Mr.& Mrs. Gordon	200
Herberts, Dr. Dana T.	100
Heyding, Mr. Lawrence F.	200
High, Ms. Lynne	100
Hillier, Mrs. B.	100
Hing, Mrs. Chan Yiu	500
Ho, Mr. & Mrs. R. W.	150
Ho, Mr. & Mrs. E. P.	100
Ho, Mr. & Mrs. Henry	100
Ho, Mr. & Mrs. Richard	100
Hogue, Mr.& Mrs. Maurice	100
Holt, Mr.& Mrs. B.G.	100
Holyoak, Mr.& Mrs. James K.	100
Horner, Mrs. Mary I.	100
Hooper, Joyce L.	100
Horsey, Ms. Joan	100
Horwood, J.V. & P.M.	100
Hoskins, Mr. Herbert C.	500
Howard, Mr. John	1,000
Hsieh, Mr. William	100
Huckell, Ms. Karen	100
Hudlin, Agnes M.	100
Hungerford, Ms. F. Mary	100
Hungerford, Mr. R. M.	3,000
Hunter, Mr. & Mrs. Stanley	100
Hutcheon, Mr.& Mrs. R.G.	100
Hyatt, Jr., Mrs. Glen C.	349
Ickringill, Mr. David G.	500
Ing, Mr. Albert	200
Innis, Mrs. Anita	2,361
Inouye, Mrs. Chiyo D.	200
Ip, Mrs. Virginia	200
Ireland, Q.C., Mr. William E.	3,000
Ivany, Mrs. Christine	100
Jacobs, Mr. Raymond A.	100
Jang, Ms. Lucy	100
Janzen, Mr. & Mrs. Henry	100
Janzen, Cheryl	350
Jeanes, Ms. Viola	1,000
Jenkins, Mr. David E.	100
Jenkins, Ms. Sylvia	100
Jennings, Mr. David	200
Jennings, Mr. David C.	100
Jewesson, Ms. A.M. Nancy	200
Jewitt, Mr. Louis A.	100
Joe, Dr. & Mrs. A. K.	110
Johal, Mr. Asa	5,000
Jones, Mr. G. Gordon	100
Jukes, Andrew J.	100
Julia L. Hart, Mr. Nicholas Paczowsk	100
Jung, Mr.& Mrs. Wei C.	100
Kacan, Mr. B.	700
Kadatz, Mr. Gerard	100
Kaye, Ms. Barbara	100
Keating, Mr. G.A. (Marianne Ping Memorial)	2,000
Kelch, Gerd	100
Kellington, Mrs. Sheelagh	200
Kenmuir, Ms. Mary L.	100
Kennedy, Ms. S.J.	175
Kennedy, Mr. Clarence D.	6,000
Kennedy, Ms. M. C.	300
Kho, Mr. Peter	100
Kimmett, Mr. Gordon	100
King, Ms. B.A.	100
King, Mr. Jack N.	100
Kinloch, Mr. & Mrs. H.	500
Kinnon, Mr. R. R.	200
Kipp, Mrs. Evelyn E.	250
Kirstein, Mr. Tom	100
Kirstiuk, Mrs. Barbara	100
Kirwen, Mrs. Sheila	200
Klaassen, Dr. & Mrs. David	3,000
Knowling, Dr. M.	120
Knox, Ms. M.H.	1,000
Koehler, Mr. Horst	100
Koerner, Mr. & Mrs. John	3,000
Konrad, Mr. Abe H.	100
Kornelsen, Dr. R. O.	200
Kornelson, Myles M.	100
Kostashuk, Dr. Ed	750
Krystal, Dr. Gerald	300
Kudaka, Mrs. H.	100
Kurchak, Mr.& Mrs. Basil	100
Kwan, Mr. Vincent	200
Kwok, Mr. Colin	1,000
Lai, Ms. Adeline	500
Lam, Ms. Dorothy Tan	100
Lam, Mr. Arthur	100
Langergraber, Mr. L.	125
Lantzius, Ms. Annette	100
Lau,Mr. Fred Y. W.	100
Lawson, Ms. Sheila	100
Leal, H. A.	500
Learman, Mr. E.	100
Lee, Mr. Pius H.	100
Lee, Mr. Milton G. H.	100
Legge, Mrs. Sharon	100
Lenehan, Mrs. Helmy	100
Leonard, Mr.& Mrs. N.	100
Leong, Mr. F.	1,000
Leong, Alan Kwok Wai	100
Lester, Mr. Richard K.	250
Leung, Mrs. Loretta	100
Levant, Ms. Barbara	100
Lewis, Ms. Lucy C.M.	100
Liang, Ms. Mary T.	100
Lindemere, Mr.& Mrs. Gordon	100
Linsley, Ms. Anna	1,000
Lockhart, Mr.& Mrs. D.	100
Lockyer, Ms. Barbara	100
Long, Mr. William C.	500
Long, Mrs. Agnes	500
Long, Mr. Arthur M.	500
Lopes, Frances	100
Lore, Mrs. Susie	100
Lozinski, Ms. Joan	100
Luciuk, Dr. George	300
Ludgate, Dr. Charles M.	225
Lum, Mr. Norman	100
Lum, Mrs. Irene	500
Lundell, John	100
Lynch, Ms. Wanda E.	1,000
Ma, Mr. Chuk Ho Christ	100
MacDonald, Mrs. Ruth	100
MacDonald, Mr. Ross A.	100
MacDonnell, Ms. Rita	150
MacFarlane, Mr. J.A.	100
MacFarlane, Ms. Shirley	100
MacFarlane, Mr. J. R.	100
MacFarlane, Gordon	100
MacIntosh, Mr. Robert M.	100
MacKay, Mr. Colin B.	1,000
MacKay, Mr. Hugh J.	1,000
MacKenzie, Mr. Murray	250
MacLean, Mr. Victor F.	40,000
MacMillan, A.	100
Macey, Mr. William J.	200
Macfarlane, Mrs. John	500
Mah,Mr. & Mrs. Eugine	200
Mah, Mrs. Bella	300
Malkin, Mrs. Frances L.	100
Malkin, Mr. James M.	100
Manning, Mr.& Mrs. J.M.	100
Mapson, Mr. Herbert F.	400
Marceau, Ms. Barbara	100
Marcil, Mr. Corey	120
Marks, Mr & Mrs. D. C.	300
Marr, Penny	100
Marshall, Mr. Phillip C.	100
Martin, Ms. Susan	200
Matson, Mr. W. A.	100
Matthison, Mr. Henry A.	400
Maughan, Ms. Diana	250
Mavor, Mr. & Mrs. James	250
McBride, Mrs. Olwen	100
McCallum, Mr. & Mrs. Robert	100
McCarthy, Mrs. Grace	100
McCoy, Mrs. W. A.	225
McDermott, Dr. M. W.	200
McDonald, Mr.& Mrs. David	100
McDonald, Mr. Ian W.	100
McDougall, Mrs. C. D. A.	100
McFaul, Mr. Ken	100
McGregor, Dr. & Mrs. G. I.	200
McIntosh, Ms. Marilyn D.	200
McKain, Mr. James	100
McKim, Dr. Anson	500
McLaughlin, Mrs. D.J.	100
McMillan, Mr. & Mrs. Gordon	100
Mckinstry, Mrs. Nancy	200
Medeiros, Mr.& Mrs. Alfredo	300
Melville, Mr. R.T.	100
Menzel, Mrs. L.	100
Messer, Mr. & Mrs. Robert	100
Miao, Mrs. Lena	100
Mickelson, Mr. George J.	100
Mighton, Ms. Susan	200
Miller, Ms. Violet	1,000
Miller, Mr.& Mrs. Keith	100
Miller, Mr. & Mrs. John	100
Miller, Mr. Horace	100
Millington, Ms. Maureen	100
Milton, Ms. Ethel	100
Mitchell, Mr. G.	100
Mitchell, Ms. Doreen	100
Mizgala, Dr. H. F.	200
Model, Ms. Rosa	391
Molberg, Mr. William	100
Molcak, Ms. Ruth J.	100
Molson, Ms. A.	300
Montgomery, Mr. Rowland	100
Montseon, Mrs. A.	100
Moore, Mrs. Margaret	1,500
Moore, Mr. Fred B.	500
Moore, Ms. Lisa	215
Mora, Ms. Vivian	100
Morgan, Mr. Brian D.	100
Morgan, Mrs. K.	100
Morrell, Mrs. Esther	100
Morrison, Mrs. Mary	200
Mott, Mr. L.	1,000
Mouat, Mrs. Isabella	200
Moysa, Mr.& Mrs. N.	200
Mueller, Dr. H.	1,000
Muir, Mr. W. Keith	100
Mullery, Ms. Mariiou	115
Murphy, Dr. B. A.	250
Murphy, Mrs. D. G.	100

Murray, Ms. Mary E.	100
Murray, Mr. & Mrs. William/Doreen	1,000
Nagai, Kimi	100
Nagy, Mrs. Jennie	1,000
Neetz, Mr. Cal	100
Negraiff, Mrs. Annie	100
Neilly, Gary & Susan	100
Nelson, Mr. Melvin	500
Nelson, Mr. & Mrs. J. T.	100
Neufield, Mr.& Mrs. Paul	200
Neville, Mr. Jack	100
Ng, M:. & Mrs. Lin Hing	100
Niedermeier, Mr. S.H.	100
O'Brien, Mr. W. J.	100
O'Brien, Mrs. Helen	100
O'Brien, Mr. Robert	105
Oliverio, Ms. Maria	100
Ostlund, Mr. & Mrs. Wilbur	100
Ottenbreit, Ms. Janet	100
Owen, Ms. Brita J.	100
Panet-Raymond, Ms. Francine	200
Parker, Mr. Dale G	1,000
Patterson, Mrs. Phyllis	150
Peck, Ms. Brenda	200
Pedersen, Ms. Elsebeth	100
Peebles, Mr. W. N.	100
Pekrul, Mrs. Margaret A.	100
Penny, Mr. Charles	1,500
Peters, Randolph	300
Pettapice, Dr. H. Graham	200
Phelan, Mrs. Isobel	100
Phillips, Mr. Edwin C.	200
Piggott, Ms. Euphemia G.	100
Pitts, Mr. John W.	1,000
Pitts, Margaret	1,000
Plumb, Mrs. Joan H.	100
Pochinko, Ms. Donna	100
Pontifex, Dr. A. H.	200
Poon, Mrs. Lily	100
Poon, Mr. & Mrs. Jason	250
Pospischil, Mr. Marty	100
Prevost, Mr. & Mrs. G. F.	100
Primas, Mrs. Elfrida	100
Prpic, Ms. Maria	100
Quinn, Mrs. Jane	200
Read, Mrs. Christina M.	100
Reid, Mr. J.	250
Reid, Mr.& Mrs. A.	450
Reith, Mrs. Jeannie	100
Richards, Mr. R. M.	150
Richards, Mrs. A.	1,000
Richards, Mr. James F.	100
Richardson, Mr. D. O.	500
Richler, Ms. Nancy	850
Ridley, Frederic N.	1,000
Rivest, Mr. L.	115
Roach, Mr. & Mrs. John	100
Roberge, Mr. & Mrs. Hector	200
Roberts, Ms. J.	100
Robertson, Ms. Susanne	837
Robins, Mrs. Lenore A.	100
Robins, Dr. R.E.	500
Robinson, Mr. William G.	1,200
Robinson, Mr. & Mrs. Ralph	100
Rogers, Mr. R.G.	100
Rogers, Mrs. Wendy K.	100
Rose, Mrs. Patricia A.	100
Rowland, Mr. Walter M.	100
Roy, Ms. Jocelyne	150
Royal, Ms. Marjorie I.	100
Rudd, Mr. & Mrs. Kenneth F.	100
Rupcic, Mr.& Mrs. Ivan	100
Rurs, Ms. Elizabeth	1,000
Russell, Mr.& Mrs. John G.	100
Russell, Mrs. Daisy	100
Russell, Mr. Edward J.	2,000
Rust, Mr. Thomas	1000
Rustad, Mr.& Mrs. J.	100
Sacks, Mr.& Mrs Abe	2,500
Samograd, Wesley/Helena	1000
Sankey, Mrs. Jean H.	100
Sankey, Mrs. Jean H.	100
Sarkari, Ms. Noshir P. D.	300
Saunders, Mr. & Mrs. Peter Paul	50,000
Sawatsky, Mr. Roland	100
Sawula, Mrs. Marion	100
Sawula, Mr. Stanley	1,000
Sawyer, Ronald & Corrine	200
Sawyer, Mr. & Mrs. Lloyd	200
Say, Ms. Angeline	100
Schermerhorn, Mrs. M. C.	100
Schmidt, Mrs. M.Y.	100
Schmidt, Mr. & Mrs. W.	500
Schmidt, Ms. Barbara M.	600
Scholefield, Ms. Marguerite	200
Schramm, Mr. Richard G.	600
Scott, Mr. R. W.	100
Scott, Mr. & Mrs. W.B.	150
Seelbach, Mrs. R.	500
Seng Kee, Mr. & Mrs. Lee	100
Shah, Mr. Anjeli K.	200
Shaw, Mr. Ralph	2,000
Shepard, Mr. & Mrs. D.	125
Shepperd, Dr. M. J.	100
Shone, Miss. E.	200
Sim, Colleen	100
Skarsgard, L.	600
Skelding, Mr.& Mrs. J.	100
Skirrow, Mr. Ernest P.	100
Skov, Ms. Esther	250
Slym, Ms. Leigh Anne	500
Smart, Mr. Gordon	100
Smart, Mr. & Mrs. Jack	100
Smith, Mr. A. D.	177
Smith, Mrs. Lois E.	100
Smith, Mrs. Gwen	150
Smith, Mr. T.C.	100
Snavely, Mr. & Mrs. C. M.	100
Snelgrove, Mr. B.G.	100
Soldan, Ms. Ethel D.	100
Southam, Mr. G.T.	200
Spence, Mr. Lindsay	100
Spetifore, Ms. Elsie	500
St. John, Mr. & Mrs. Bill	100
Steele, Mr. W.H.	100
Steer, Mr. Wm. H.	100
Stepenko, Mr. Paul	300
Stephens, Mrs. Olive	1,000
Stevens, Leslie P.	100
Stevens, Mrs. B. A.	200
Stevenson, David	2,500
Stewart, Mr. Oswald J.	5,000
Stockmayer, Mr. & Mrs. O. H.	100
Stoneman, Ms. Audrey G.	500
Stowell, Leslie	300
Stranks, Mr. Leslie R.	1,000
Stringer, Mr. G. V.	150
Suarez, Mr. Andres	1,000
Suddard, Ms. Gladys M.	100
Sung, Mrs. Quon	100
Sung, Mr.& Mrs. Wilfred	100
Surine, Mrs. F.H.	150
Szeto, Mr. & Mrs. Peter	100
Szydlowski, Mr. Stephen	100
Taggart, Valerie J.	350
Tait, Mr. Henry	500
Takaki, Mr. Richard	100
Taviss, Mr. & Mrs. S.	100
Taylor, Mr. Thomas	100
Taylor, Mrs. Marjorie	100
Taylor, Mr. J. E.	100
Taylor, Mr. Norman E.	800
Taylor, Ms. E.	120
Tcheng, Ms. Audrey	100
Tcheng, Audrey	100
Thompson, Mr. J. H.	1,000
Thompson, Dr. Charles A.	500
Thorne, Vera R.	600
Timbers, L.	500
Tobin, Mrs. L. A.	150
Tom, Mr. Peter	100
Tong, Mrs. Winnie	200
Towle, Mr. & Mrs. David	100
Towler, Mr. Colin	300
Trepteau, Mrs. A.	100
Tsang, Shao H.	100
Tsang, Eunice	150
Tsang, Ms. Grace	300
Tse, Ms. Grace	100
Tsin Yeh, Mr. Po	100
Tsun, Mr. P. K.	100
Turpin, Mr. James	100
Van Der Vliet, Ms. Helen	1,000
Vanderpoll, Mr. & Mrs. P.	100
Vennewitz, Mr. W.A.	100
Verrall, Mr. Anthony H.	1,000
Vielkind, Dr. Juergen R.	1,000
Vollmer, Ms. Thelma	200
Wai, Mr. & Mrs. Alex	100
Walker, Mr. & Mrs. T.	100
Walker, Agnes M.	200
Wallace, Mr. Richard	100
Wallace, Mr. & Mrs. John A.	1,000
Walton, Mr. Peter	100
Wang, Mr. Richard	100
Watson, Mr.& Mrs. J.M.	100
Weatherly, Ms. Donna	100
Weaver, Ms. L.	100
Webber, Dr. William A.	100
Weber, Ms. C.	100
Weddouren, Mr. N.	1,000
Wegwitz, Mr. Edward	100
Wei, Mr. & Mrs. Patrick	100
Weins, Mr. Henry	250
Weiss, Mrs. Louise	100
West, Mr. E. H.	200
Weston, Mr. John	100
Whiles, Ms. E. Luanne	100
White, Mr. D.	100
Whittaker, Ms. Gwen C.	100
Whittall, Mr. H. Richard	200
Whittall, Ms. Jocelyn	100
Wickstrom, Mr. & Mrs. H. G.	300
Wiedmayer, Mr. A.	100
Wilkie, Dr. David	200
Williams, Mrs. M.	100
Williams, Ms. Joan T.	100
Williams, Mrs. Eva M.	100
Willow, Sky Fire	150
Wilson, Ms. Judith	100
Wilson, Ms. Pat	100
Winskill, Ms. A. A.	1,000
Wolfe, Dr. J. Blair	250
Wollenden, Mrs. Betty	100
Wong, Mr.& Mrs. P.	600
Wong, Mr. Fred	100
Wong, Mr. K. W.	100
Wong, Mr. Yui - Chi	100
Wong, Ms. Maria	5,000
Wong, Mr. Chow	1000
Wong, Dr. A.G.	100
Woo, Mr. Carson	100
Woodward, Christopher	2,500
Woolley, Mr. Charles E.	200
Wright, L.F.	200
Wright, Mr. Fred R.	5,000
Wright, Mr. N. E.	100
Writh, Mr. Leonard F.	1,000
Wu, Mr. Philip	100
Yeatis, Mrs. Helen	100
Yeh, Mr. James	100
Yeung, Mrs. Renee	5,000
Yip, Dr. & Mrs. Barry	100
Yoke Kong, Madam Tan	100
Young, Mrs. V.E.	100
Yu, Mr. Nicholas M. K.	200
Yuen, Mr. Stephen H. B.	100
Yung, Yang Yuan	200
Zablotny, Mr. & Mrs. Len P.	140
Zinder, Ms. Ruth	100
Zlotnick, Mr. Mark	100
A.N. & A.F. Vets L.A. Taurus 298	100
A.N.& A.F. Vets L.A. Van. Unit 20	100
Aberdeen Elementary School	100
Air Canada	2,250
Alcan Smelters & Chemicals Ltd.	45,000
Allmar Distributors Ltd.	100
Alydar Limited	100
Anonymous	100
Anonymous	500
Arbutus Roofing & Drains Ltd.	1,000
Army, Navy & Airforce Veterans	5,000
Atlas Iron & Metals Ltd.	100
Austin Animal Hospital Ltd.	100
B. C. Hydro	640
B.C. Central Credit Union	1,000
B.C. Hydro Welfare Fund	663
B.C. Police Acadamy, Class 44	3,700
B.C. Provincial Auxiliary, F.O.E.	34,713
B.C. Regiment Jr. Ranks Club	956
B.C. Telephone Company	50,000
B.C.Hydro Employees Community Fund	100
BC Gas Inc.	7,500
BC Hardwood Floor Co. Ltd.	100
Bains Trucking	100
Bank of Montreal	10,000
Bank of Nova Scotia	5,000
Bank of Tokyo Canada	1,000
Banque Nationale De Paris	300
Barb Wood Graphics Ltd.	650
Barney's Enterprises	300
Bentall Group	200
Brinkhaus The Jewellery Source Ltd.	100
Bristol-Myers Squibb Pharmaceutical	5,000
British Pacific Properties Limited	500
Broadway Properties Ltd.	10,000
Bucci Investment Corporation	100
Bull Housser & Tupper	100
C.U.P.E. Local 561	100
CU&C Health Services Society	100
Canada Trust	5,000
Canadian Forest Products Ltd.	10,000
Canadian Imperial Bank of Commerce	7,500
Canadian Marconi Company	100
Canadian Pacific Limited - CP Rail	50,000
Canadian Western Bank	250
Cangene Corporation	17,750
Canterbury Coffee Corporation	1,000
Caravelle Foods	200
Cariboo Hill Band Parents' Assoc.	100
Cedar Grove Marina & Sales Ltd	300
Central Saanich Little League	100
Chancery Software Ltd.	1,000
Chevron Canada Limited	100
Chinese Catholic Youth Organization	100
Chritchley Medical Services Inc.	1,000
Cigna	235
Cominco Ltd.	25,000
Confederation Life Insurance Co.	2,500
Consolidated Silver Standard Mines	100
Contact Hardware Specialists	100
Cottonwood Campsite	300
Crestbrook Forest Industries	200
Daiwa Corporation	500
Darryl Innis Foundation	5,000
Davis & Company	3,600
Deka Lake Volunteer Fire Department	100
Deloitte & Touche	1,000
Delta Place Hotel	200
Diamond Foundation	10,000
Dominion Company	1,000
East-West Capital Associates	1,000
Elite Investments Ltd.	100
Empire Stevedoring Company Ltd.	1,750
Empl'ee Comm. Serv. Fund	2,565
Eng. & Wright Partners, Architects	200
First Marathon Securities Limited	2,500
Fletcher Challenge Canada Limited	15,000
Fraternal Order of Eagles	100
G. & B. Estates Ltd.	5,000

Galaxie Collision (1979) Ltd.	100
Geneva Capital Corporation	1,500
Goepel Shields & Partners Inc.	1,000
Golden West Bakery Ltd.	1,000
Good Companions Club/S. Burnaby	300
Gorge Road Hosp. Empl'ee Fund	500
Graham Apps & Company	409
Great Canadian Casino Company	1,000
Grosvenor International Canada Ltd.	25,000
H. M. C. S. Quappelle	500
Helix Biotech Corporation	864
Heritage Landscaping Ltd.	300
Hollenberg Holdings Ltd.	500
Hongkong Bank of Canada	200
Household Finance Corp. of Canada	500
Hy's of Canada Ltd.	5,000
Imperial Parking Limited	1,000
Inland Glass & Aluminum Ltd.	200
Innomed Christie	500
Inst. of Chartered Life	100
Interville Development Ltd.	100
Inwest Investments Ltd.	220
Jacobs Suchard Canada Inc.	10,000
Jericho Service Yard	1,050
Jones, Kwong, Kishi, Consulting Eng.	200
Josco Holdings Ltd.	53,000
Kamloops Swing & Jazz Society	100
Kelfor Industries Ltd.	400
Kelowna Radiology	1,000
Kenneth R. Mackenna Ltd.	1,185
Ladies Auxiliary	100
Lafarge Canada Inc.	2,500
Laing Property Corporation	500
Leftouers Fishing Group	100
Lignum Sales	200
Lougheed Texaco	100
M. K. Wong & Associates Ltd.	2,500
MCD Holdings Inc.	100
MacMillan Bathurst Inc.	500
MacMillan Bloedel Limited	75,000
MacMillan Bloedel Ltd. Port Alberni	200
Manufacturers Life Ins. (Kamloops)	291
Manufacturers Life Insurance Co.	5,000
Marathon Realty Corporation Ltd.	1,000
Margaret Hogarth Trumbull Agency	10,000
Marsh & McLennan	1,000
Martin Brower of Canada Ltd.	1,000
McDonalds	2,000
McGavin Properites Ltd.	1,000
McLean Foundation	5,000
Medical College of Wisconsin	200
Mentor College	100
Michael McMahon Personal Law Corp.	250
Minerva Technology Inc.	100
Mining Association of Canada	2,500
Mitsubishi Canada Limited	100
Mobile Data International	100
Mr.G.Walter Nelson Enterprises Ltd	100
Mutual Life of Canada	100
Nestle Enterprises Limited (B.C.)	1,000
Nestle Enterprises Limited (Ont.)	1,000
Norco	3,000
Northwood Pulp and Timber Limited	100
Novam Development Ltd.	3,000
Novapharm Ltd.	1,000
O. B. A. Holdings Limited	1,000
Ocean Construction Supply Ltd.	2,500
Office of the Public Trustee	1,000
Officers and Crew Fraser Titan	122
Operating Engineers Local 115	100
Owen Bird	2,000
PBK Engineering Ltd.	400
PCL Constructors Western Inc.	100
Pacific Coast Fishermen's Insurance	200
Pacific Northwest Removal	400
Pacific Northwest Removal Service	100
Pacific Region and Field Staff	115
Paragon Restaurant & Hotel Supplies	100
Penreal Advisors Ltd.	1,000
Phillips Cables Limited	100
Phillips Hager & North Ltd.	10,000
Polaris Realty (Canada) Ltd.	200
Princeton Mining Corporation	7,500
Prospero Group	100
Purchasing Management Association	100
Purdue Frederick Inc.	2,000
Pythian Sisters,Maple Temple #20	2,000
Quilchena School	105
Radd Holdings Ltd.	1,000
Raeside Equipment Ltd.	250
Redl Sports Distributors	100
Rhone-Poulenc	5,000
Royal Bank - Staff	110
Royal Bank of Canada	7,500
Royal Canadian Legion #172 Esquim.	250
Royal Canadian Legion Ladies Aux.	100
Royal Jubilee Hosp. Empl'ee Fund	660
Royal LePage Real Estate	150
Royal Swingers Dance Club	202
Royal Trust	2,000
SHL Systemhouse Inc.	100
Seaboard Life Insurance Company	1,000
Seaspan International Ltd.	2,100
Security Pacific Bank Canada	500
Segal,Joseph (Family Foundation)	1,000
Sidney Little League	100
Sing Tao (Canada) Ltd.	200
Sisters of the Immaculate Heart	100
Snavely Forest Products Inc.	1,000
South Carvolth Elementary	100
St. Francis Xavier Ladies Club	100
Surrey Credit Union	1,700
Teachers Credit Union	100
Team Wood Traders Limited	100
Teck Corporation	7,000
Telephone Employees Community Fund	15,474
The Pantry, The Harvest Inn Inc.	100
Tilbury Cement Ltd.	2,500
Toronto Dominion Bank-Pacific Div.	3,000
Training and Safety Section	100
Travels by George	100
UMA Group	1,000
United Contractors Ltd.	100
United Way of the Lower Mainland	110,175
Upjohn Company of Canada	500
Vancouver City Savings Credit Union	5,000
Vancouver Fire Fighters' Union	500
Vancouver Foundation	349,838
Vancouver Public Aquarium	100
Vancouver School of Theology	379
Vancouver Wharves Ltd.	250
Vanderpol's Eggs	1,000
Vanlin Holdings Ltd.	2,000
Variety Club of B.C.	77,884
Victoria Cancer Clinic Staff	2,150
Victoria Foundation	245
W.A. to A. Maxwell Evans Clinic	100
W.A. to BCCF & CCS	5,000
Walter, Dr. W.S., Inc.	100
Weiser Inc.	200
Weldwood of Canada Limited	10,000
West Coast Energy Inc.	15,000
Western Assembly Ltd.	500
Western Forest Products Limited	4,000
Whyt Bros. Painting	150
Woodward Foundation, Mr. & Mrs. P.A.	4,750
Workmans Compensation	315
York House School	1,500
Total Donations under $100	$263,524
Total Donations, including fund-raising projects	$1,916,945

Bequests from the estate of the late:

Arnott, John J.	52,000
Cameron, Laura Eleanor	10,959
Cameron, Mary	42,247
Carson, William Andrew	500
Drew, Frank Anthony	1,000
Dwyer, Francis John	200
Floyd, Esther	5,000
Gahr, Florence Velma	26,293
Garrett, Margaret	1,000
Gillis, Gertrude	42,114
Grieg, John Wesley Edward	199,761
Hemminger, Helen	13,621
Holliday, Vera	2,000
Jennings, Mary	4,973
Johnston, Dorothy Elizabeth	7,333
Kemp, Jonn W.	1,000
Little, Eleanor G.	804
Mainwaring, Leonora Evangeline	1,201
McIntyre, Elizabeth Adeline	11,510
McKaig, Jane	50,000
Milliner, Amy	250
Morrison, Olive Vera	500
Murphy, William B.	2,218
Paynter, Emily Alfretta	1,763
Riley, Ada	127,500
Rogers, Marie Grace	50,000
Roy, Henretta	3,870
Sanderson, Irene Stewart	23,137
Schroder, George Frederick	500
Smith, Elsie McDonald	1,000
Stewarthis, Hazel, J.	100
Street, Doris	30,675
Tweedie, Edith (Memorial Fund)	2,461
Weaver, Diane	1,127
Wilkes, Robert W.S.	12,208
TOTAL	$730,825

Bequests designated for specific purposes: From the estate of the late:

Atkinson, Raymond G.	17,402
Brown, Esther Mae	160,758
Cullingford, Henry W.F.	28,435
Dwyer, Francis John	800
Hwang,	13,420
Mracevich, Dannila	5,050
Royal Trust (for Lavender Memorial Fund)	35,000
TOTAL	$260,865